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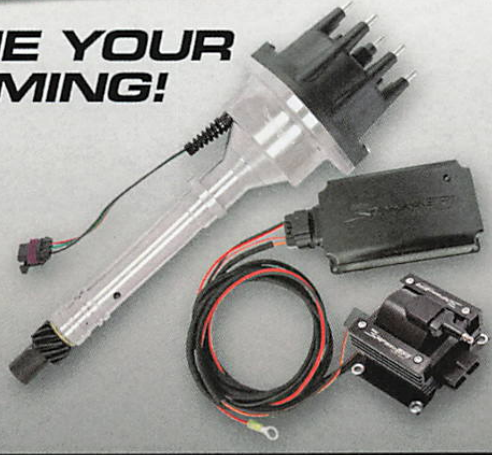

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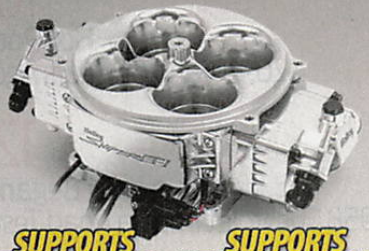

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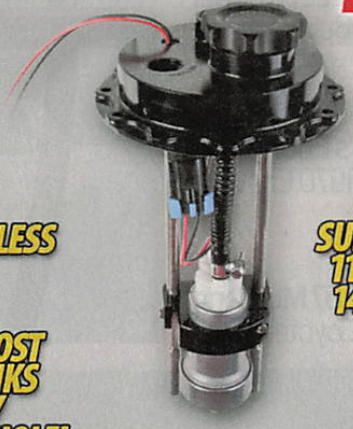

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The first Road Tour car paired with the newest Road Tour car. Photo by **Tommy Lee Byrd**

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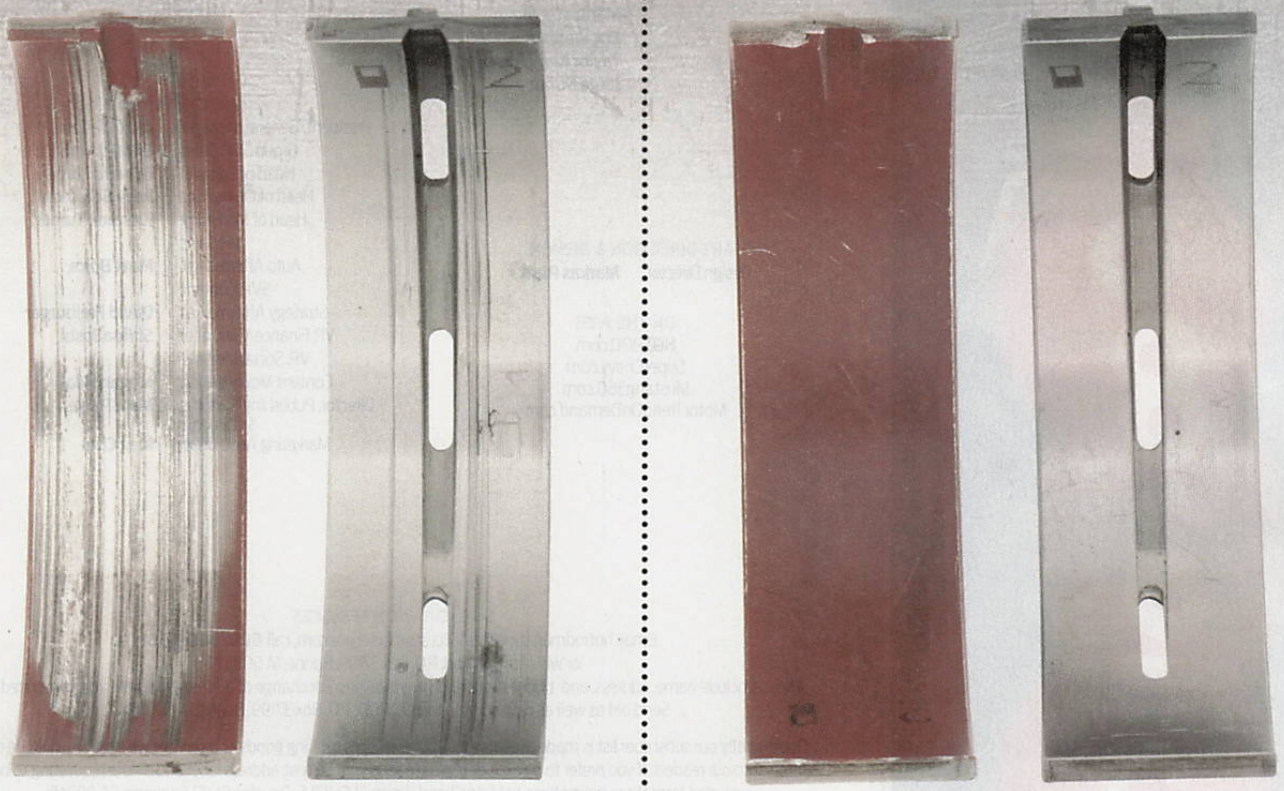

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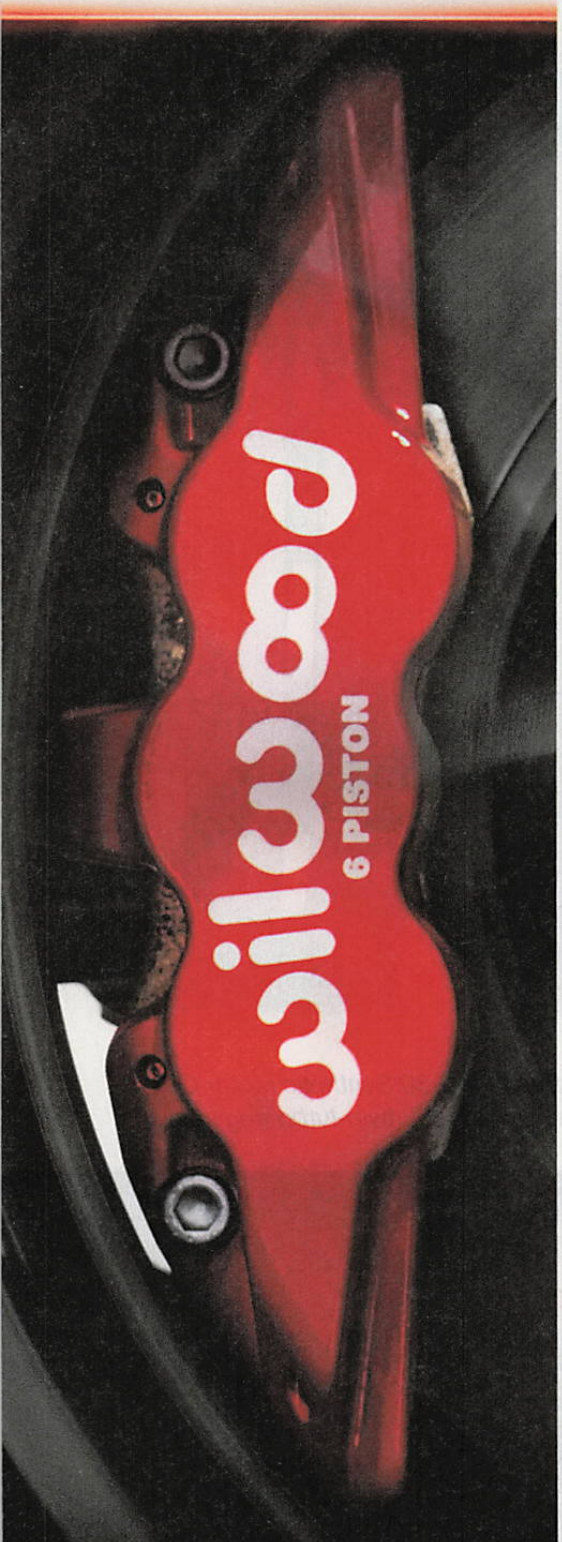

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California Coastal Road Trip

Like many people around the country, we have had little occasion to travel this year. With car shows and events like the Power Tour and Drag Week postponed and rescheduled due to the coronavirus, we've mostly been stuck at home. I recently had occasion to travel to Santa Rosa, California, for a photo shoot with Scott Birdsall, owner/builder of Old Smokey, the Cummins-powered Ford F1 that beat the diesel-engine record at the Pikes Peak International Hillclimb. Motor Trend's William Walker was the shooter, with me serving as assistant and camera car driver. It seemed like as good excuse as any to make a trip out of it.

By John McGann

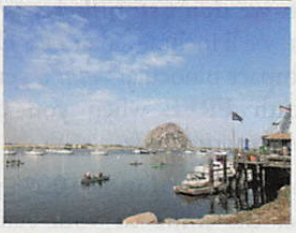
Editor-in-Chief

@john.mcgann

Santa Rosa is about an hour north of San Francisco and 436 miles from our offices in Los Angeles, by the most direct route. I took the more scenic route, driving north on Highway 101. The rolling hills closer to the coast are a more interesting landscape for a road trip than the relatively flat central valley traversed by Interstate 5. Highway 101 also cuts through the center of San Francisco and takes you across the Golden Gate Bridge, which is always worth a photo op with my phone.

Our shoot went swimmingly, and the pictures are going to look great in an upcoming issue of HOT ROD. With that accomplished, I found myself heading for the coast, and traveling home on Pacific Coast Highway, California's Route 1. I picked up PCH in Santa Cruz, just north of the Monterey Peninsula, and after an unexpected (and inexplicable) traffic jam, the city faded to stunning vistas of the Central Coast.

The sun was setting as I drove through Big Sur; it was something I hadn't planned, but that happy coincidence made for some amazing pictures. Big Sur is a part of the coast where the Santa Lucia Mountains terminate abruptly at the ocean. There's roughly a 90-mile stretch of PCH that carves this boundary between land and sea, and it is some of the most beautiful scenery I've ever seen. The region of Big Sur ends at the small town of San Simeon, and that's where I stopped for the night with plans to check out the local elephant seal colony the next morning.



The beaches just north of San Simeon are home to an elephant seal colony that is inhabited throughout the year by seals of differing ages and sexes. The adult male elephant seal has been described as having a prominent proboscis, and that overgrown nose is apparently quite attractive to the lady elephant seals. This time of year, the only seals on shore were juveniles and adolescents–teenagers if you will–so no big noses were in sight. Still their snuffling, grunting vocalizations and comical flopping mode of locomotion were worth the diversion and made me appreciate having legs and vocal cords. After some time watching the seals, I headed south to Morro Bay for coffee and a stroll through its harbor area. Morro Bay is a scenic coastal town with a waterfront landscape dominated by a 581-foot-tall volcanic plug. It's a unique feature of the California coast that is visible for many miles. The area is home to harbor seals and barking sea lions as well as a colony of California sea otters. The town is quaint and quirky with lots of local restaurants, craft stores, and art galleries. It's a cool place we visited several times for the Car Craft Anti Tour, and it's been about six years since I was there.

From Morro Bay, I got back on the freeway heading south for home. Though it was only a short break from what's become the norm, the experience was a much-needed soul cleansing. Project Jake, the '93 GMC, was my worthy roadgoing partner in crime, and it was great to be behind the wheel with the windows down, racking up the miles and taking in the sights and sounds of being on the road again.

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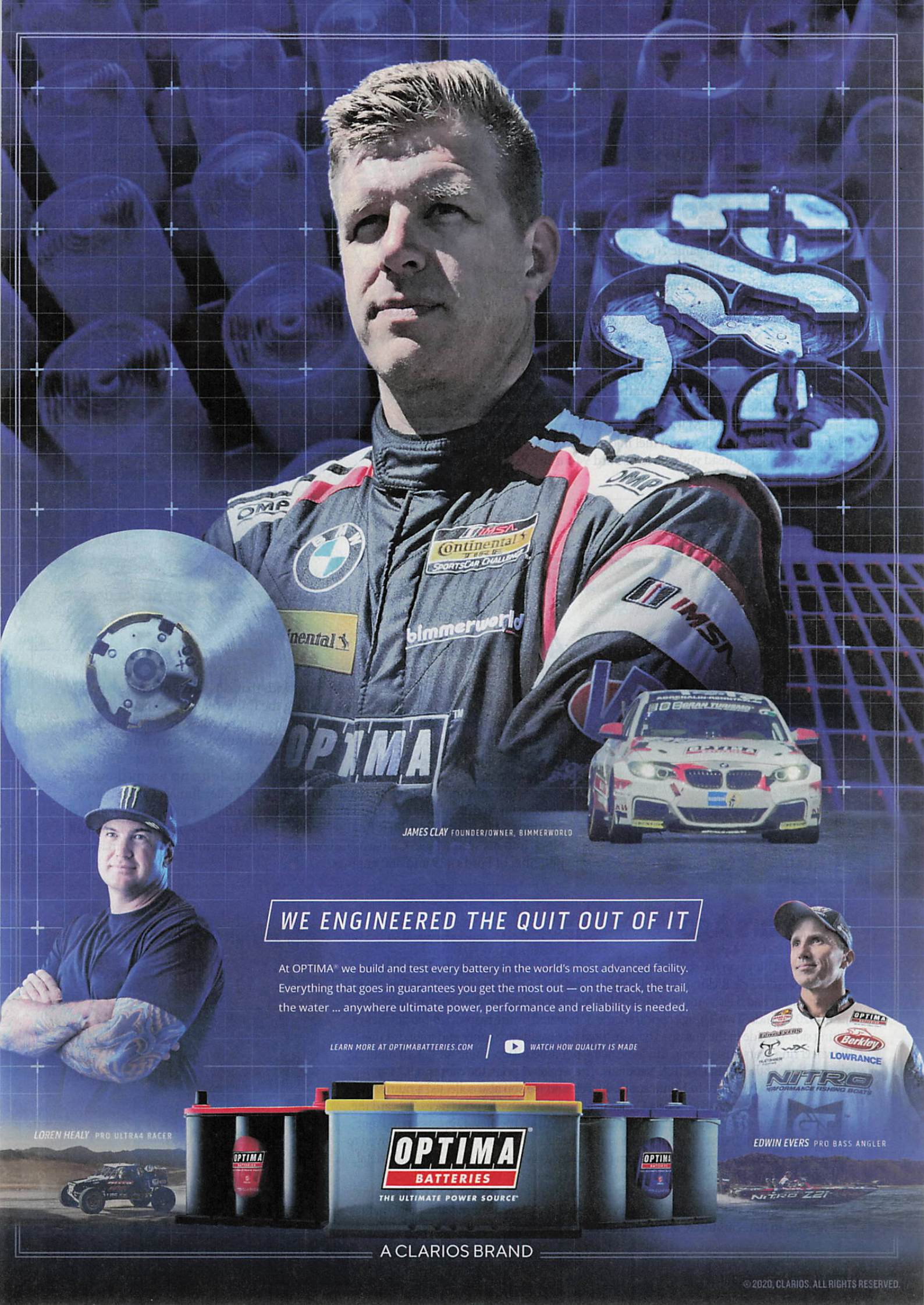
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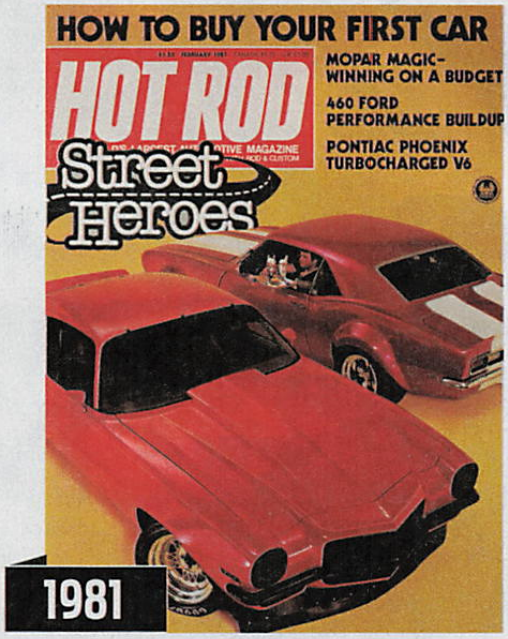
The HOT ROD Archives

20 Years Ago

February 2001: 132 pages, $3.99

EFI was the name of the game 20 years ago. Twenty pages in this issue were devoted to the subjects of building a high-pressure fuel system, a wiring kit buyers' guide, computer-controlled emissions controls, and an accounting of a carburetor to EFI conversion. Likewise, the cars featured within the issue were fuel injected—one was a 1965 Nova SS wagon with Holley's ProJection 4.0 system on a 327 small-block. There was also a '72 Challenger with a Magnum 360 engine and Hillborn mechanical injection converted to electronic control with a Speed Pro ECM. We also liked the '49 Mercury with a 32V 4.6L Modular engine snatched from a Lincoln Mark VIII. The cover car, a '40 Ford Deluxe Business Coupe was not fuel injected, however. It had a proper-looking Flathead with a trio of Ford 94 carburetors on an Offenhauser intake.



40 Years Ago

February 1981: 120 pages, $1.50

The two Camaros on the cover were dripping with that '80s street machine vibe, and we'd be happy to take either on a trip along the California coast. Inside, there were actually three similarly-built Camaros in the feature. All were small-block powered—the '68 had a 380 cubic-inch engine built by the legendary Ed Pink, and the '73 had an LT-1 350 with a cam upgrade. The third car was an orange '67 that also sported a fat set of fender flares and a fistful of attitude from a warmed-over 327 engine. Lots of solid tech rounded out this issue. Tech Editor Jim McFarland dove headfirst into the chemistry behind automotive fuels and lubricants, Bruce Caldwell continued his "Build Your First Engine" series, by dropping his freshly rebuilt small-block into his second-gen Camaro, and Marlan Davis examined the performance potential of Ford's 429 and 460 engines.

60 Years Ago

February 1961: 124 pages, 35¢

That's "Two Thing" on the cover, the famous twin-engine dragster built by Dode Martin and Jim Nelson. Eric Rickman shot the photos and Don Francisco penned the feature on the car, which had been causing a stir at NHRA drag races across the country. Weighing just 1,920 pounds, Two Thing's appearance is dominated by the twin small-block Chevys sitting side-by-side in the chassis. They are tilted relative to each other and joined at their flywheel ring gears. Just prior to this issue being published, Two Thing hit 171.10 mph, the top time of the annual NHRA Nationals. The weekend prior, the car ran a 9.24 at 180.86 mph at a drag race in Minneapolis. Martin and Nelson also collected a number of engineering awards and even a Best Constructed award at several prior races. Toward the back of the issue was a three page article titled: "Metalflake, the New Dimension in Paint". Author Le Roi Smith describes the development behind Metalflake, a trade name given to the formula developed by the Dobekmun Company, a division of Dow Chemical. Metal flake has become a generic term in the waning years and is generally used to describe the heavy and thick application of large "bass boat" paint jobs popular with the Kustom crowd, but Smith's article from '61 actually describes the process for metallic paint that's still applied to new cars today, albeit in updated formulations.

HOT ROD Archives

ALL NEW

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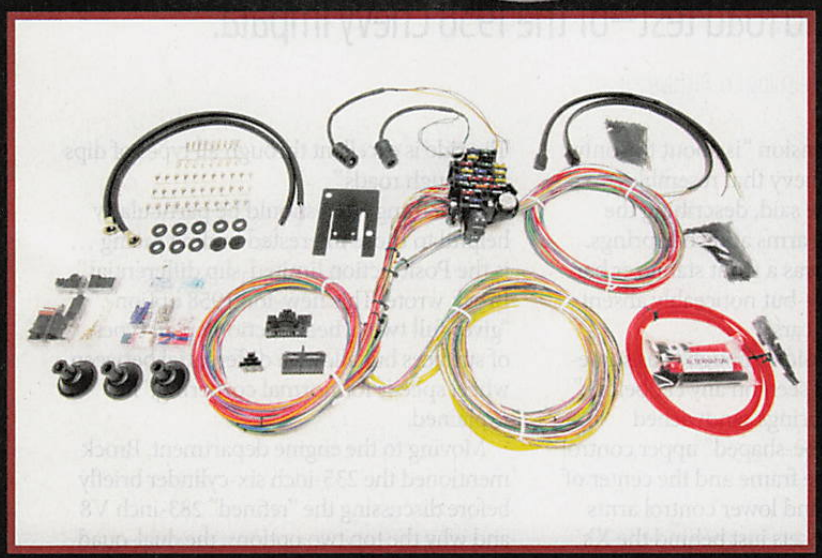
MADE PAINLESS



This 28 circuit kit is designed to fit the 1955-1957 "Tri-Five Chevy" and includes additional circuits for power options and accessories. This harness features a factory location Painless mounting plate for the fuse block, front and rear lighting sockets, factory & aftermarket instrument cluster harnesses ,and dash & turn signal connectors. This harness utilizes GM color-coded high-grade TXL wire with the circuit identification printed on it for easy installation.

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WHEN CHEVROLET INTRODUCED THE "ALL NEW" 1958 IMPALA, IT REALLY WAS!

We take a look back at the introduction—and road test—of the 1958 Chevy Impala.

Steven Rupp Drew Hardin, Ray Brock, Bob D'Olivo and Peterson Publishing Co. Archive

To contemporary eyes, nothing seems small about 1958 Chevrolets. But put the car next to the imposing figure that was HOT ROD'S technical editor Ray Brock (all 6 feet, 2 inches of him), and the magazine can rightly say the all-new Chevy Impala "displays a low silhouette," even with a roof height of 4½ feet.

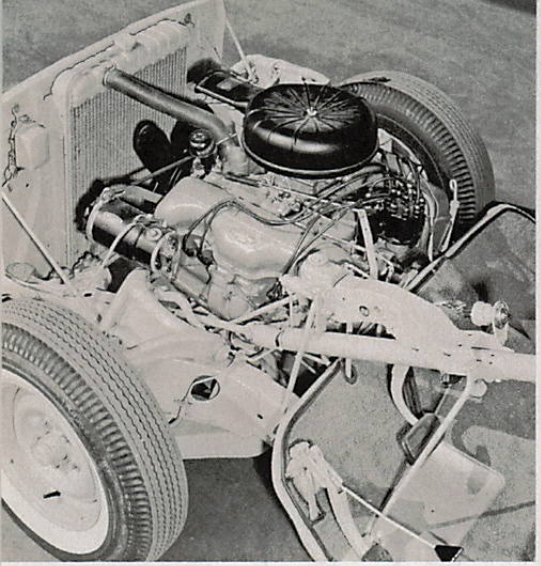
Automakers like to throw around the phrase "all new" every time they make even a few refinements to a model. But in this case, Chevrolet's sedans were truly redesigned from the frame up. The previous ladder-style chassis was replaced by framerails with a central X-member that was "very resistant to the twisting forces that are transmitted to it," wrote Brock in HOT ROD's December 1957 issue. In addition, the new frame's "low-slung design permits minimum overall car height while also providing plenty of foot room for rear seat passengers."

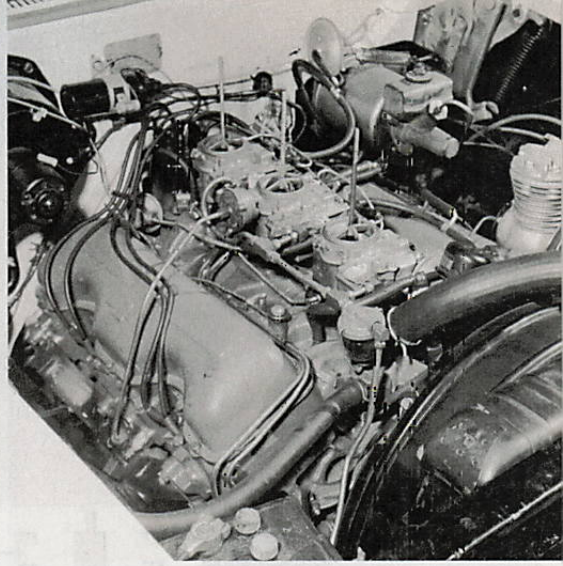
The front suspension "is about the only part of the new Chevy that resembles the '57 models," he said, describing the unequal-length A-arms and coil springs. New for the year was a front stabilizer bar for all V8 models—but noticeably absent from six-cylinder cars.

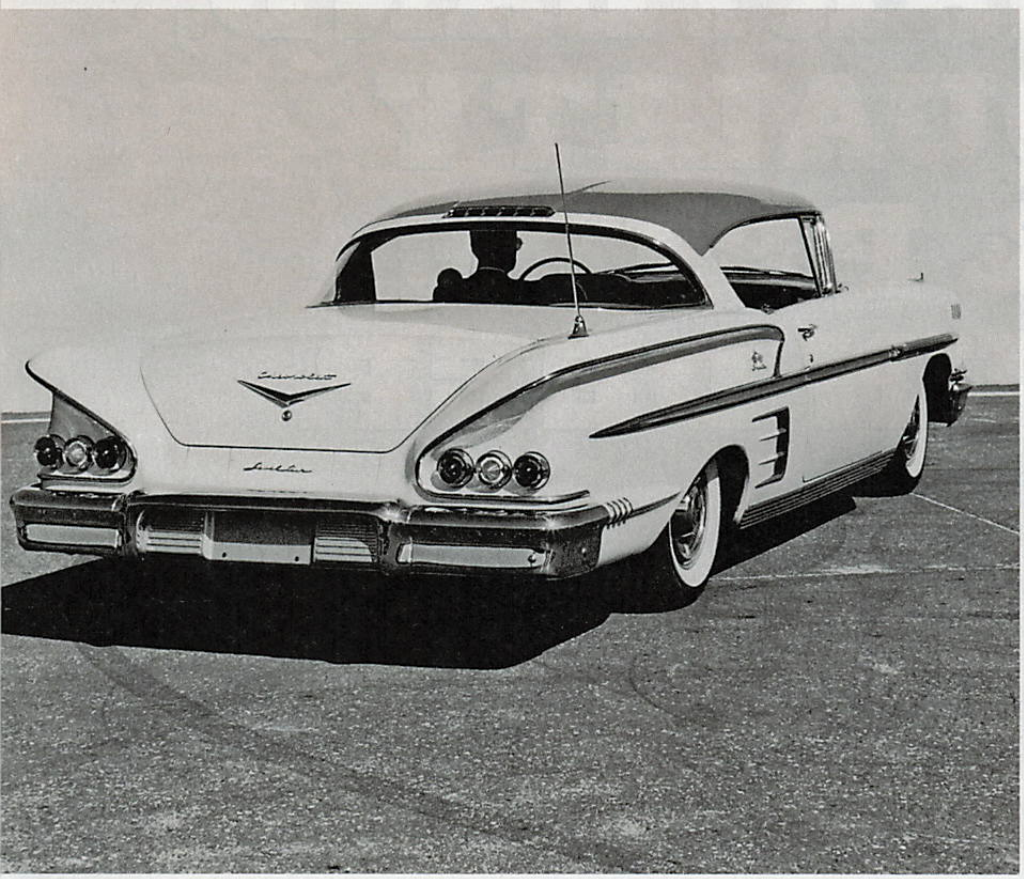
The rear suspension, though, was something "you haven't seen on any car before," Brock said. Coil springs sandwiched between "horseshoe-shaped" upper control arms bushed to the frame and the center of the axle housing, and lower control arms that ran from brackets just behind the X's center to a second set of brackets welded to the ends of the axle housings. "The linkage arrangement between the control arms and the axle is such that torque and braking forces are taken by the control arms, with 'nosedive' on stops and 'squatting' on acceleration almost completely eliminated. The ride is excellent through all types of dips and rough roads."

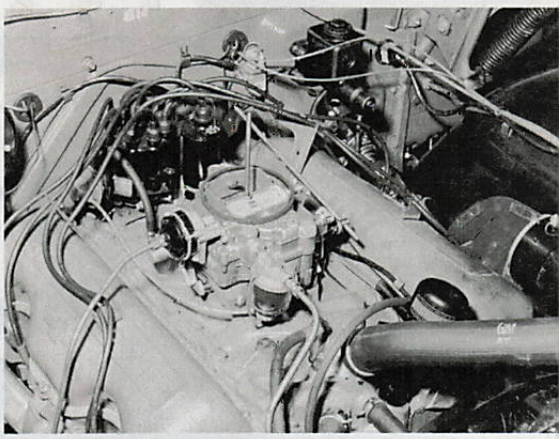
Something "that should be particularly helpful to those interested in drag racing … is the Positraction limited-slip differential," Brock wrote. This new-for-1958 option "gives full two-wheel traction on all types of surfaces but allows a differential between wheel speeds for normal cornering," he explained.

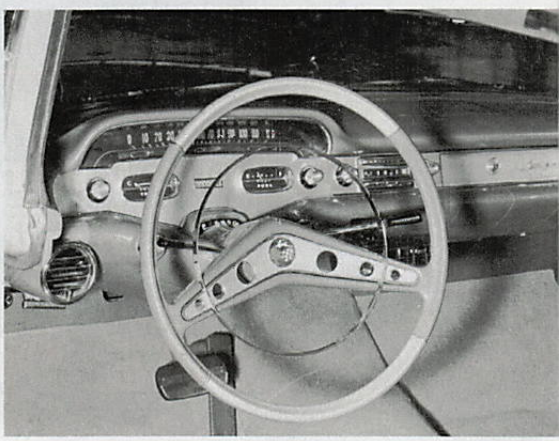
Moving to the engine department, Brock mentioned the 235-inch six-cylinder briefly before discussing the "refined" 283-inch V8 and why the top two options, the dual-quad and fuel-injected versions, had lower horsepower numbers (245 and 250, respectively) than the 1957 versions. "First, all of these passenger-car engines have hydraulic lifters, therefore a milder cam than the mechanical cam used in the '57 performance models and secondly, you'll notice that 9.5 to 1 is the











maximum on compression, even with the injector." Only the Corvette could get a 10.5:1 small-block and the resulting 290 horses.

"Now we get to the part a lot of you have been waiting for," Brock wrote, saving the news about the all-new 348-inch engine for last. "This is not just a bored and stroked version of the 283 V8, although lots of pieces from the two engines resemble each other." He pointed out that the intake manifold forms the top engine cover, the distributor is at the rear of the block, and the fuel pump is at lower right. The 348, though, was longer, wider, and about 100 pounds heavier than the 283, the latter stat one of the reasons the engine wasn't offered in the Corvette. (It would "upset the superb balance of the car," he said.)

Two of the story's eight pages were devoted to the 348's construction, including its "odd-shaped rocker arm covers." With a single Rochester or Carter four-barrel carburetor, the engine was rated at 250 hp at 4,400 rpm and 355 lb-ft of torque at 2,800 rpm. An optional triple-two-barrel carburetor setup brought power up to 280 horses at 4,800 rpm. Peak torque remained at 355 lb-ft, though it came in higher at 3,200 rpm.

"Only one cam is available for the 348 engines," noted Brock. "And although it looks good on paper, a racing grind should help considerably, especially with the three two-barrel carburetors."

Another hole in Chevy's 1958 offering: "You cannot order an overdrive with the 348 engine. Sounds strange, but that's the straight scoop. Too bad because the 348 engine with triple carburetion, stick shift, overdrive, and a 4.11 rear axle should make quite an automobile."

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Solid & Striped

The Lokar/Street Rodder '34 Ford 3-Window Coupe 25th in a Long Line of Road Tour Hot Rods

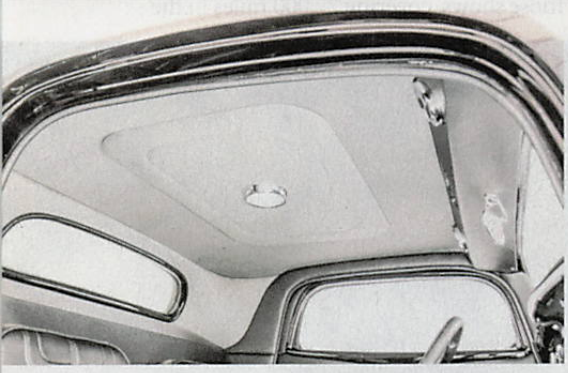
Tim Bernsau Tommy Lee Byrd

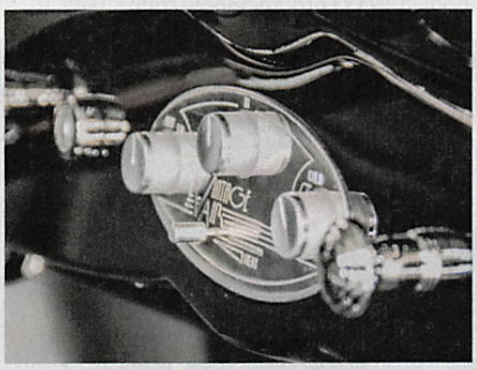
You've probably been following the progress of the Lokar/Street Rodder Road Tour 1934 Ford coupe throughout the year. The stunning black and gray 1934 Ford 3-window is finally finished, photographed, and revealed right here.

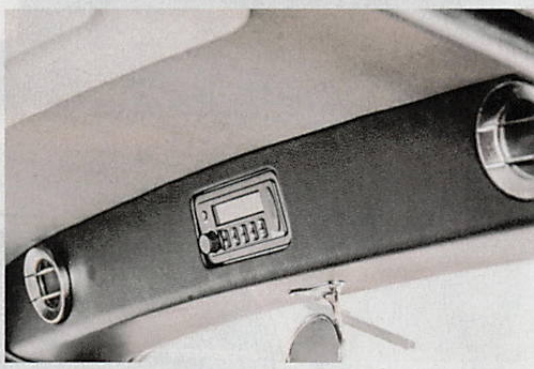
"It seems like just yesterday that we set out on the highway in a blue 1933 Ford coupe with white racing stripes." –Jerry Dixey, Road Tour director, 1996-2020

In 1996, the idea of building a street rod and driving it all over the country wasn't really that radical; that's been the point of the street rodding since the earliest days. But *Street Rodder* magazine commissioning a car built entirely from aftermarket parts and then putting it on the road for three months was definitely ambitious.

That very first Street Rodder Road Tour car was a beauty—a Redneck fiberglass-bodied 1933 Ford 3-window coupe, built at Lobeck's Hot Rod Shop in Cleveland, Ohio. The eye-catching paint job was a combo of PPG Bonneville Blue and a couple of wide white racing stripes running the length of the car. The coupe would have been a smash hit on the car show circuit, trailered from venue to venue for pampered celebrity appearances, but that was never the plan. Instead, Jerry Dixey, the guy behind the whole Road Tour idea, drove that car to those shows, covering 27,000 miles in the







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course of 82 days. After its season of virtually non-stop cross-country cruising, the history-making rod was given away in a drawing, and was eventually attained by Debbie Walls of Lokar Performance in Knoxville, Tennessee, who has driven it ever since. Dixey has been driving ever since as well, each year planning and hosting Road Tours, always in a brand-new street rod.

The 25th annual Lokar/Street Rodder Road Tour 1934 Ford coupe represents a full-circle return to that car that started it all. This coupe, like its older brother from 1996, is created from a Redneck Street Rods fiberglass 3-window body. It was built by Larry Brunkala and Danny Tesar and the team at Precision Hot Rods and Fabrication, in Macedonia, Ohio. Precision is located 10 minutes from where Barry Lobeck's shop stood 25 years ago. Tesar was a builder at Lobeck's at the time, and helped build the first Road Tour car.

Brunkala and Tesar worked with illustrator Micheal "Casti" Castiglione to establish the look of the 25th anniversary coupe. The design is not a replica of the original car, now famous as the "Blue Skunk." This one is a black and charcoal tribute. The flavor is similar, but many of the details are different.

The Redneck 3-window coupe body is manufactured with the roof and cowl filled, and the filled top chopped a just-right 2⅝ inches. The Alumicraft 1933 Ford grille shell and insert on this car, combined with the 1933 hood (curved louvers in contrast to the straight louvers on a '34), is likely to start a few debates about the intended year of the replica roadster, but it's a '34. United Pacific Industries provided the 20-gauge stamped steel front and rear fenders, 7-inch LED headlight lenses and Dietz buckets, and 1933 to 1936 Ford LED taillights. Precision removed the blisters from the United Pacific steel rear splash pan and cut notches for the Flowmaster stainless-steel exhaust tips.

The rally stripe design on this year's Road Tour car was modeled after the original Road Tour coupe from 1996. Once again, PPG generously provided the paint. Precision's paint and body man, Mark Mindzora, worked at Lobeck's shop when the "Blue Skunk" was built. Mindzora was responsible for the paint job then and pulled the paint gun trigger on this year's car too. Both times, the results have been incredible. The color combo was accomplished with three coats of PPG Deltron DBC basecoat. The darker color is Strong Black. The lighter is Jatoba Brown Metallic, a BMW color that Precision chose for the rally stripes. Mindzora finished the coupe with four coats of Deltron Concept urethane clear.

The extraordinary paint job is accented by the perfect plating provided, as always, by Sherm's Custom Plating. In addition to hosting the West Coast leg of the Road Tour for many years, Sherm's has been a long-time sponsor of the Road Tour cars, always making sure that the brightwork on them is perfect.

Before the body was touched, Precision Hot Rods was building the platform for the coupe. Precision builds their framerails in-house from four individual pieces of 10-gauge steel, beefed up with a Pete & Jake's front crossmember and a custom-built X-member. The 'rails were narrowed 2½ inches per side in the rear to make room for the wide tires that were coming. The 2-inch C-notches drop the frame low over the rear axle.

In addition to the crossmember, Pete & Jake's provided the 1937 to 1941 style spindles with bolt-on steering arms, a Super Bell 4-inch-drop tube axle, and the front tube shocks. Flaming River provided steering components including the Vega-style box and Pitman arm, built specifically for street rod applications. In the rear, a John's Industries 9-inch with 3.50:1 gears is located by a triangulated four-bar suspension, also from P&J's, plus an antiroll bar and a pair of QA1 coilovers. The front and rear disc brakes are from Wilwood. The remote master cylinder wakes the brakes, and the four-piston calipers do the grabbing. There are inline residual pressure valves in the front and rear brake lines, and the rear also includes a proportioning valve. The stainless steel 1933/1934 Ford fuel tank from Tank's Inc. holds 16 gallons of gas.

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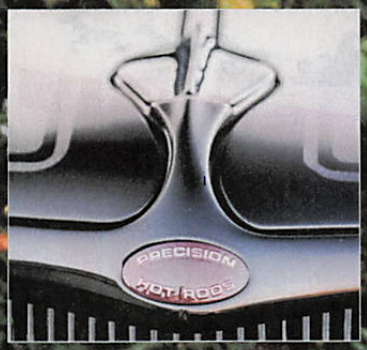

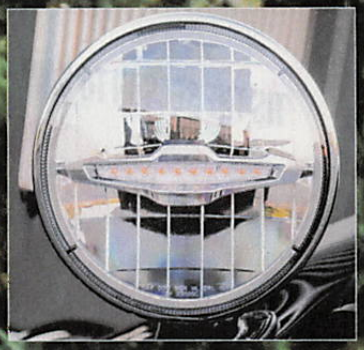

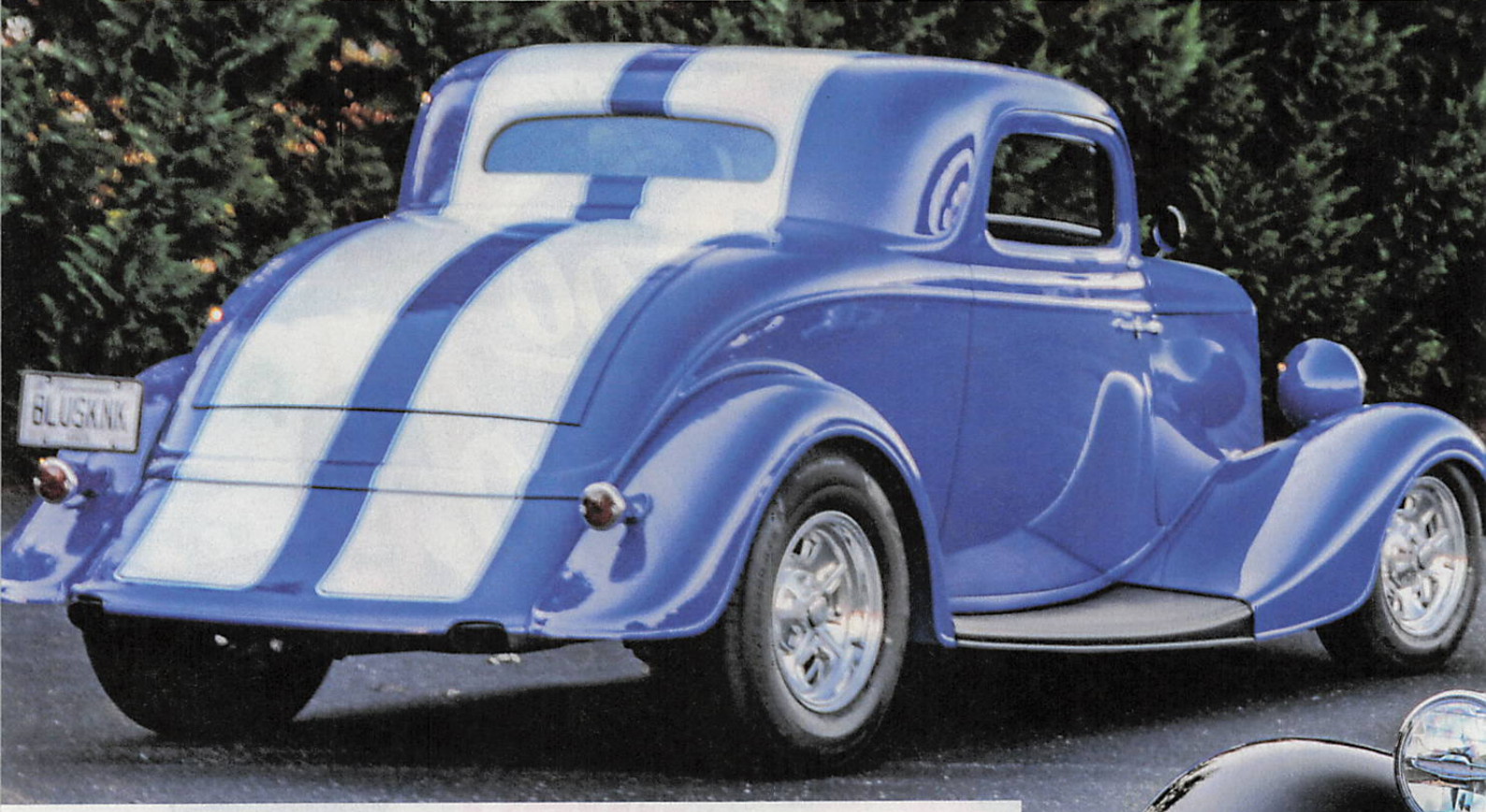

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outward image of the 2020 Lokar/Street Rodder Road Tour '34 could be perceived different ways. Black is worn by gentlemen as well as outlaws, and where some will see classy and sophisticated, others will see wild and defiant. Since the coupe's image could go in either direction, the tire and wheel selection needed to be able to as well. Billet Specialties' Crossover wheels from the Vintage Series come in a few different finishes, but gray powdercoat is perfect for the coupe's personality, however you see it. The front wheels are 18x7-inchers, the rear wheels 20x10. They roll on Continental ExtremeContact tires measuring 215/40ZR18 and 295/45ZR20.

The "Blue Skunk" '33 coupe from 1996 was built with a four-barrel Chevy 350 crate motor. In recent years, Ford-bodied Road Tour cars have all been Blue Oval blooded. The list of Road Tour Ford engines covers the field, from Flatheads to EcoBoosts to Coyotes. This year's choice is a 535-hp 427-cubic-inch Boss V8 with aluminum Z2 cylinder heads, fresh out of the crate from Ford Performance. Ford calls these engines, which are based on the Boss 351 block, modern versions of its famous 427 FE engines, but built on Windsor architecture. Nobody at *Street Rodder* could say no to the idea of harnessing 535 horses' worth of muscle car era-inspired power under the four-piece hood of a fiberglass 1934 coupe. Who could?

Precision Hot Rods topped the 427 with Holley's Sniper EFI self-tuning system. The system includes a four-barrel throttle body featuring a black ceramic finish (gold and shiny finishes are also available), a throttle-body-mounted ECU, and internal fuel pressure regulator. Mounted on an Edelbrock Super Victor 351W intake manifold and

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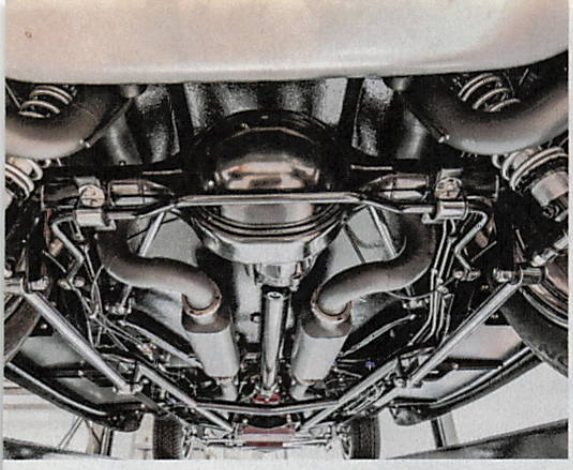

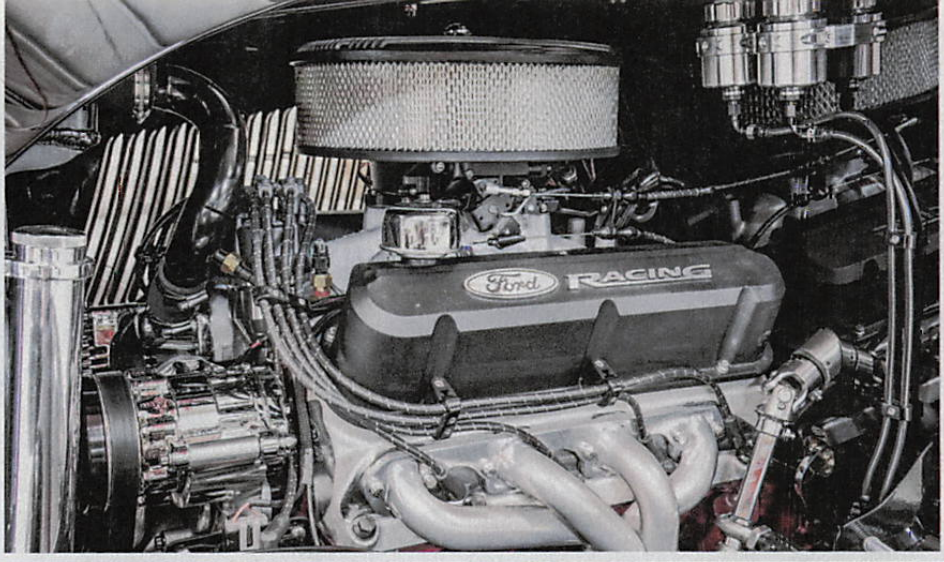

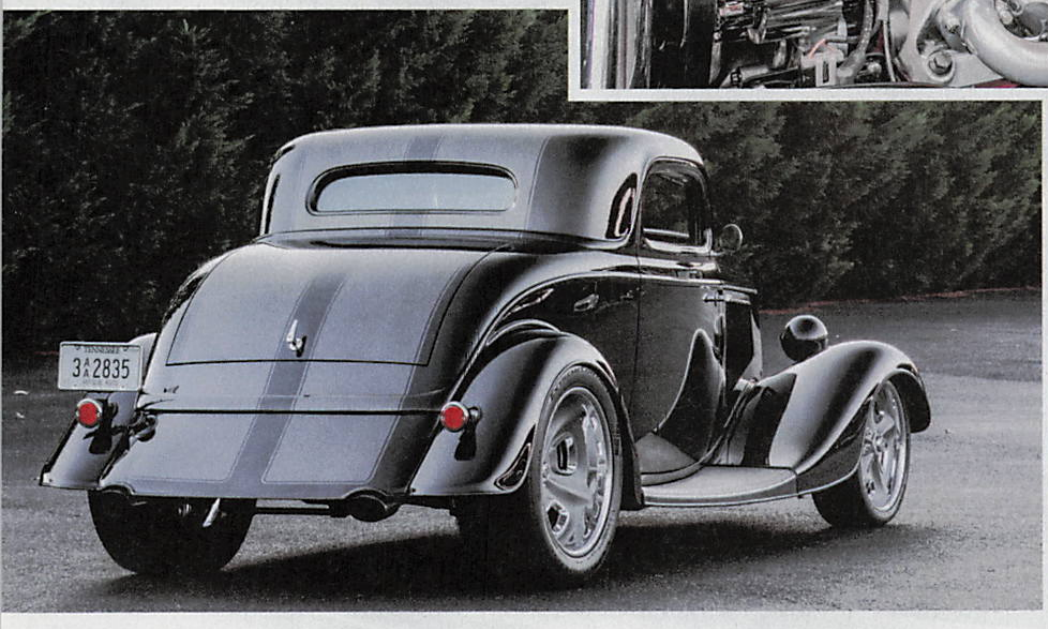

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crowned with a Holley air cleaner, Holley's up-to-date fuel injection system has a retro look that perfectly fits the coupe. A Holley Sniper Hyperspark distributor and ignition box wake things up, and Lokar cloth spark plug wires add a little more underhood vintage style. Exhaust is expelled through Sanderson shorty headers. The 2½-inch pipes are corked with a pair of square-cased Flowmaster Super HP-2 mufflers on their way to Flowmaster stainless steel exhaust tips. Back under the hood, Vintage Air's Front Runner system drives the accessories, and an electric fan and aluminum radiator from U.S. Radiator ensure that the Road Tour coupe will run cool.

Gearstar is another longtime Road Tour sponsor and supported the '34 coupe project with a Gearstar Level 4 4R70W automatic overdrive transmission. Level 4 is the top rung of Gearstar Ford AOD units, rated for applications up to 650 horsepower. It uses a custom-built billet converter, high-performance shift kit, high-capacity billet overdrive racing servo, and deep aluminum pan. Lokar Performance Products provided the shifter and cables. That 427 Ford engine makes 545 lb/ft of torque, and a Dynotech driveshaft ensures that torque is delivered to the John's Industries rearend.

You can't build a top-shelf hot rod with bottom-shelf bolts. Road Tour cars are built with the best quality fasteners, provided by Automotive Racing Products (ARP), a committed Road Tour sponsor for many years. The same goes for wiring. Painless Performance Products, another longtime Road Tour sponsor, has provided wiring harnesses and components to keep the juice moving through numerous Road Tour cars, including this year's '34 coupe.

The car's first road trip was a 500-mile trailer ride to Speed & Design in Nashville, Tennessee, where Gil Vigil stitched the interior. The Precision Hot Rods crew had already covered the interior and trunk with Dynamat Xtreme insulation to reduce noise and heat. The modified Redneck dash was fitted with a glovebox and equipped with Dakota Digital RTX series 1951/52 Chevy Car instruments. The gauges feature LED backlighting and offer Bluetooth integration and GPS with a full color high-definition data screen. The gauge faces were dressed up with Lokar and Street Rodder Road Tour logos.

An overhead console houses the Custom Autosound Secretaudio Radio LCD display sensor unit and mid-tweeter satellite speakers. The Custom Autosound System I subwoofer/two-channel amp and "black box" tuner/amplifier fit on a panel behind the driver's seat. The fabricated lower dash panel holds the Vintage Air ProLine vents and Gen II Streamline ProLine controls. Vintage Air's compact Gen II Mini is the company's smallest air conditioning unit, but it provides plenty of cool air—and fits in tight spaces, like under the dash of a '34 Ford coupe. A Flaming River 14-inch leather grip Cascade steering wheel adds some contemporary style atop the FR tilt column. Lokar Performance Products provided the pedals, door pulls, underdash e-brake, and the 16-inch floor shifter.

Gil Vigil at Speed & Design upholstered the Procar By Scat Rally series low back seats with Moore and Giles leather, adding some cool double stitching to the bottoms and backs. The fabricated steel seat risers were wired with 12V auxiliary power outlets. The black leather stretches across the handbuilt door panels. A United Pacific 1955 to 1960 Chevy 24-LED dome light is a perfect headliner accessory. The trunk includes a handbuilt retro-style smaller trunk that functions as a cover for the Optima battery beneath it. The Street Rodder logo is stitched into the straps. There is plenty of room back there for luggage, a cooler, and a few boxes of the cool Road Tour apparel and merchandise that ET Motorgear provides year after year.

It would have been a blast to set out on the highway in this incredible hot rod this year. The plan was to spend six months on seven Road Tour legs, with Jerry Dixey driving the coupe and hundreds of street rodders alongside him. That's how it's been done every year since 1996—until 2020 threw up a roadblock. For the time being, the 25th anniversary Lokar/Street Rodder Road Tour 1934 Ford coupe is in Knoxville, hanging out at home with its blue-and-white brother and waiting for 2021, just like we are.

STREET RODDER

2020 ROAD TOUR BUYER'S GUIDE

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›Billet Specialties Crossover Vintage Series Wheel: The Billet Specialties Crossover wheel is the end result of brickyard styling mixed with some nitromethane attitude. The Road Tour car features 18x7s in the front and 20x10 Extreme Wheels in the rear with a vintage gray powdercoat finish for the ultimate "Hot Rod" look. Available in 18, 19, 20 & 22" diameters with multiple finish options. Visit www.billetspecialties.com to learn more and see all the fine wheels and accessories Billet Specialties manufactures right here in the USA.

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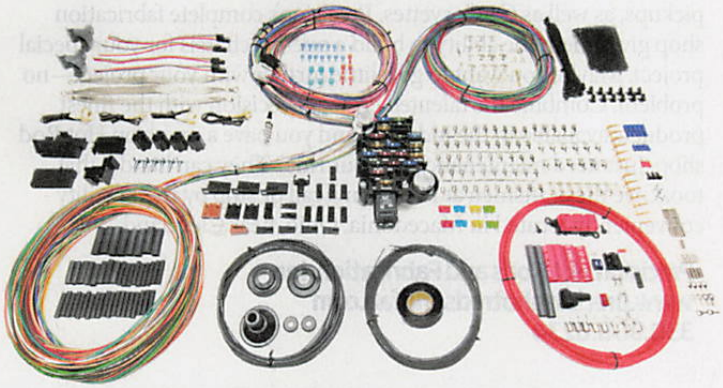

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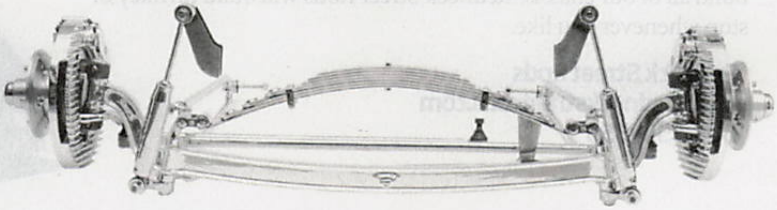

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- **Precision Hot Rods and Fabrication, Inc.**
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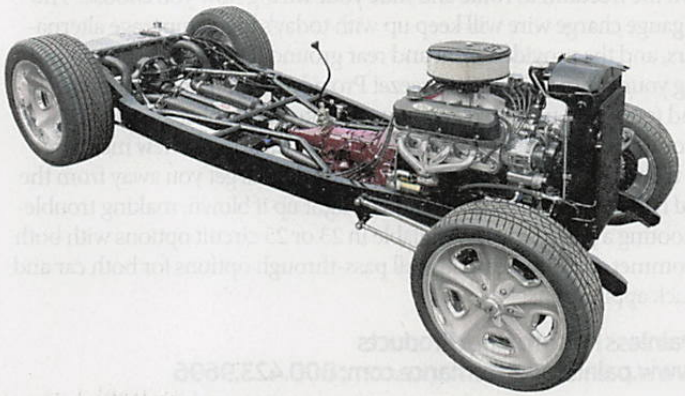

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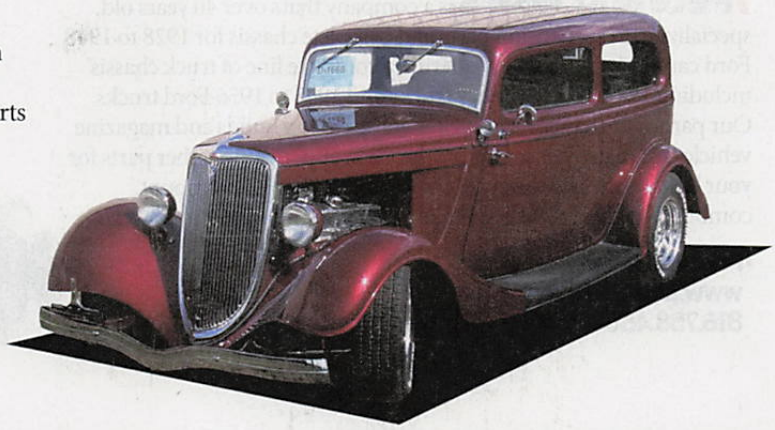

Speed & Design Hot Rod Interiors specializes in high-end, timeless, and traditional interiors. Speed & Design has completed many show-winning interiors, including Goodguys 2020 Street Rod of the Year and a Detroit Autorama Great 8 winner. S&D can complete an interior from a concept rendering, or just from an idea you have visualized. S&D uses laser cutting/engraving, 3D printing, and 3D CNC router capabilities to create stunning interiors. S&D also has a separate Aviation division to suit all Aviation interior needs.

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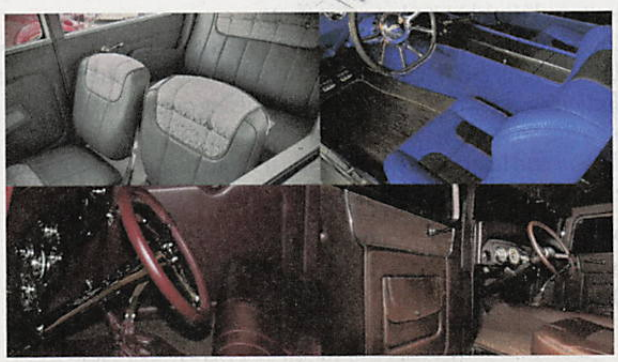

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Wilwood Disc Brakes built a complete brake package for the 2020 Street Rodder Road Tour 1934 Ford Coupe consisting of front and rear brake kits and a master cylinder. The front kit (140-8583-D) and rear kits (140-7140-D) include Forged Dynalite Internal four piston calipers with a black powdercoat finish, 12.19" diameter SRP drilled and slotted rotors, and BP-10 compound SmartPads. The rear kit also includes a one-piece drum/rotor combination to accommodate the required parking brake. The lightweight, compact design of the Remote Tandem Master Cylinder with Pushrod (260-14241-P) is the perfect fit under the floor using remote reservoirs.

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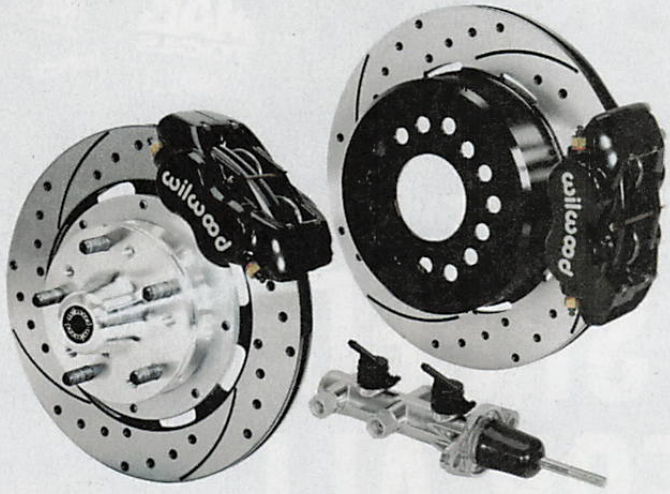

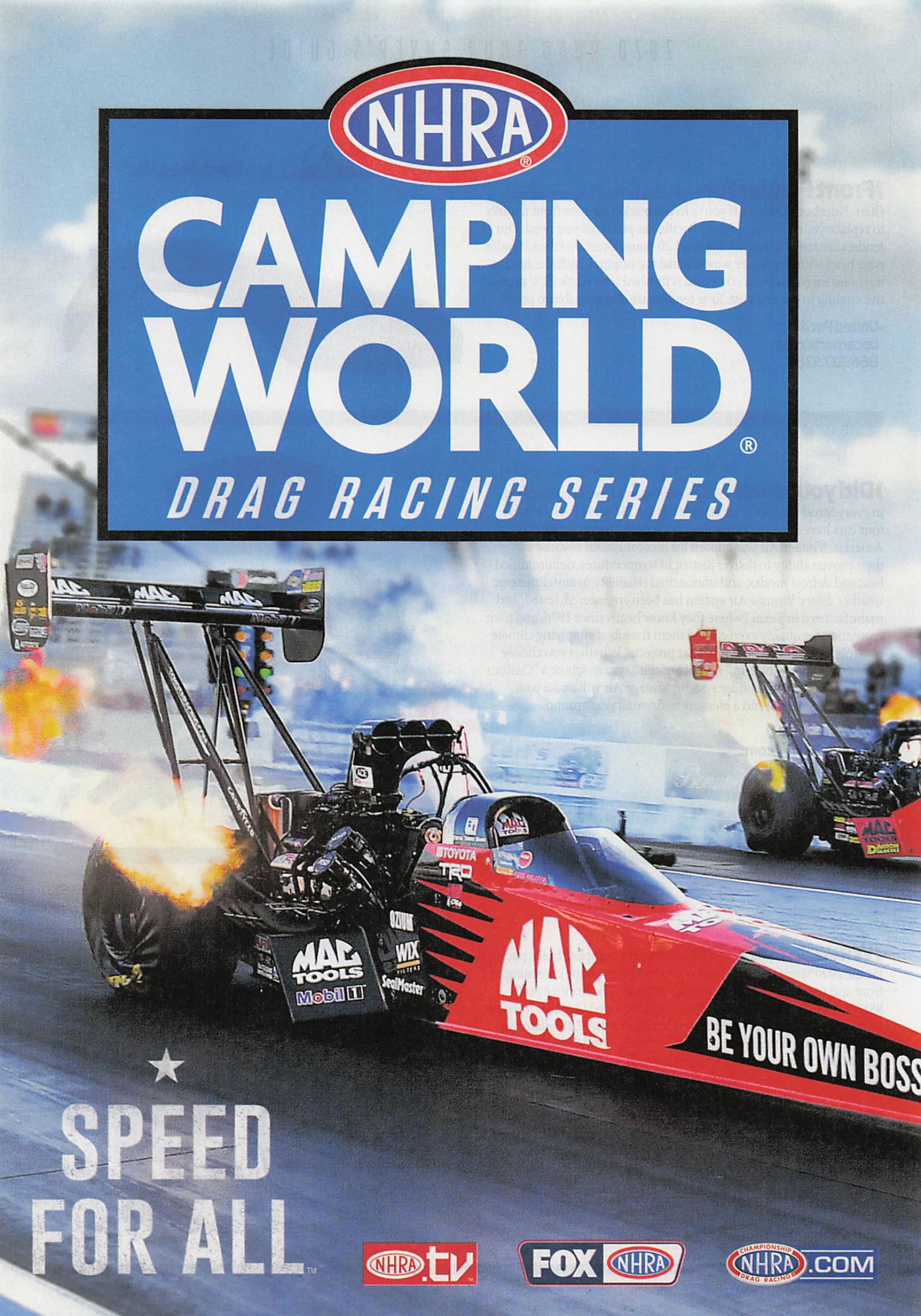
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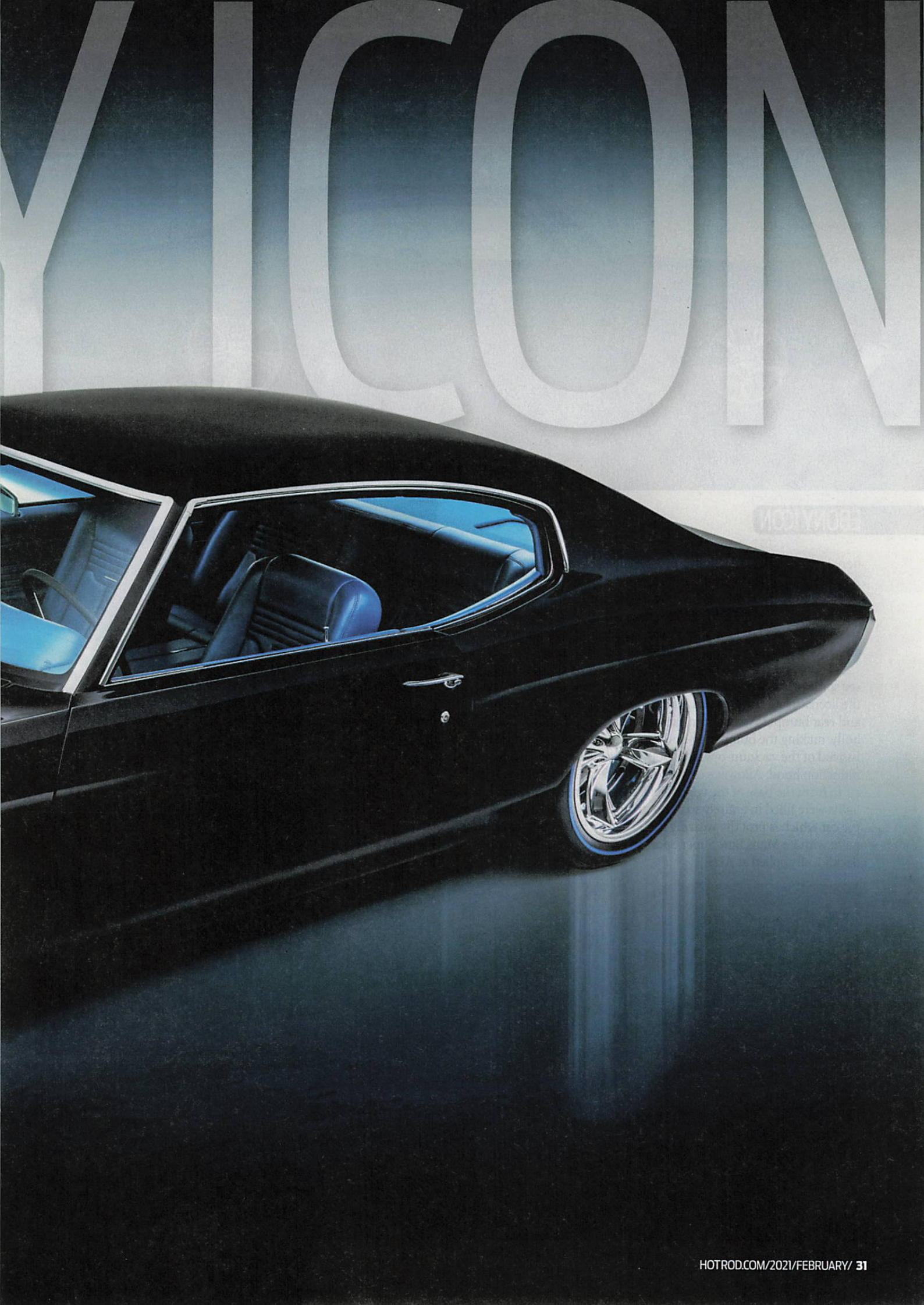
The sponsorship, beginning immediately, will be in full swing as the NHRA celebrates its 70th anniversary and Camping World celebrates its 55th year in 2021. The sponsorship is an ideal fit for both organizations. For more than five decades, Camping World has proudly offered specialized products and accessories, expert advice and professional service to RV owners and campers. NHRA's drivers, teams and fanbase are deeply-rooted in RVs, camping, towing and outdoor living.

"Camping World has a strong history in motorsports, and we can't wait to introduce them to the incredible action of NHRA's 11,000-horsepower, 330-mph racing," said NHRA President Glen Cromwell. "Our fans, drivers, teams and partners are thrilled about the potential of this relationship as we welcome Camping World as a partner and entitlement sponsor for the NHRA and its premier series."

EBON

Alloway's Hot Rod Shop Builds the Ultimate LSX-Powered Chevelle

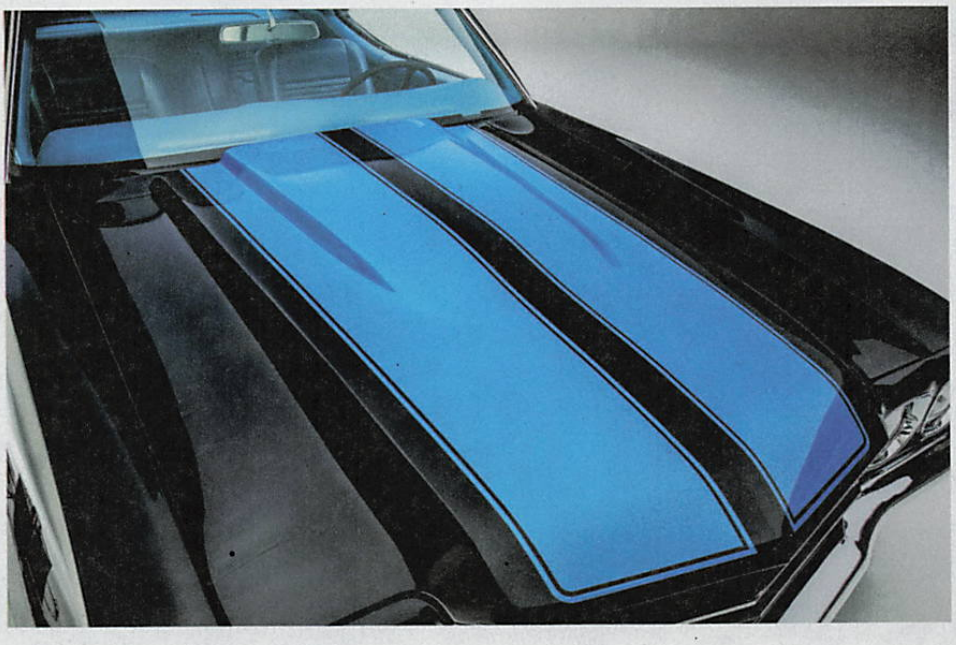
Brian Brennan Jorge Nuñez


ICON

EBONY ICON

here is a list of cars that epitomize the idealized notion of the American muscle car, and a 1970 Chevelle is definitely at or very near the top. This one was built by the skilled craftsmen at Alloway's Hot Rod Shop (AHRS), near Knoxville, Tennessee, and shows what can be done when careful planning, solid execution, and subtle modifications are applied to any vintage car.

For those who know their 1970 Chevelles, you can immediately see some of this work. The front bumper was smoothed, removing the license plate relief, making it much more appealing. The front and rear bumpers were also narrowed and tucked tightly to the body, making the bumper-to-body appearance much more pleasing. Instead of the vacuum-operated pop-up air inlet on the stock cowl induction hood, Alloway's crew modified the air inlet ducting to pull air in from the base of the windshield. In addition, the side marker lights were filled in entirely so as not to break up the overall profile of the car which is proudly wearing PPG Deltron 9700 (Alloway Black) paint with Le Mans Blue Super Sport stripes over the hood and decklid, all applied at AHRS.



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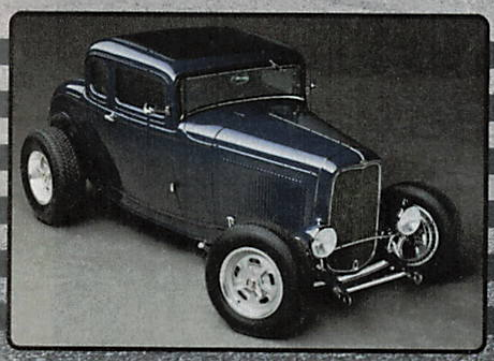

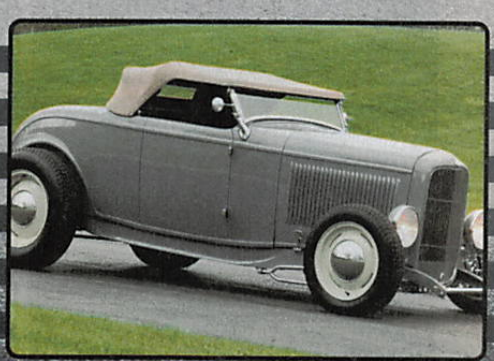

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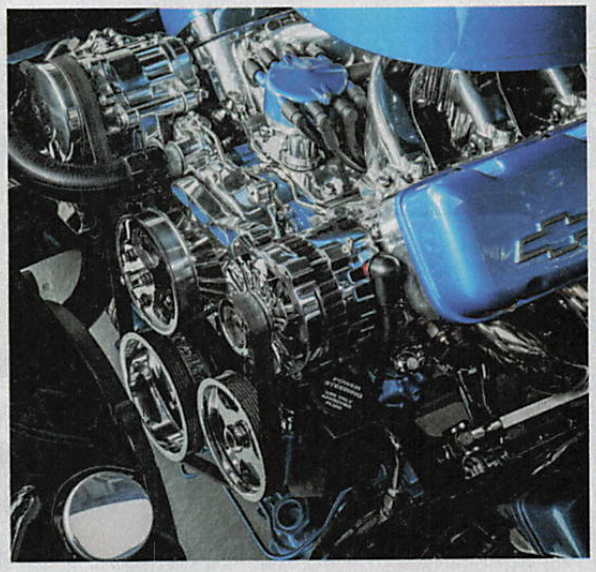
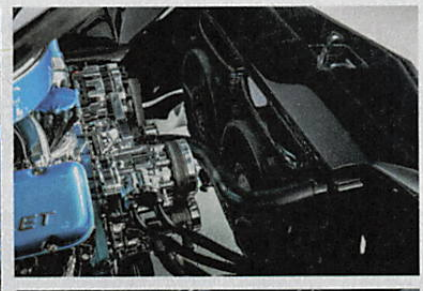
EBONY ICON

A look under the hood reveals an LSX dressed up to look like a big-block Chevy. Keith Dorton, of Automotive Specialists in Concord, North Carolina, built the 720-hp 454-cubic-inch LSX. In the words of Alloway, "It's cammed up pretty heavy," yet it happily runs on pump gas. The cylinder heads are from Chevrolet Performance and were treated to performance porting by Automotive Specialists. The custom valve covers were made from a pair of Chevrolet SB2s that were resurrected from the Hendrick Motorsports NASCAR program. Further trickery can be found under the valve covers where an MSD ignition with coil packs are located. No big-block Chevy ever came from the factory with a front-mounted distributor, so what is one doing here? This one actually serves as part of the breather for the engine's PCV system.

On the induction side, the guys chose a traditional fuel mixer in the form of a Holley 750 carburetor bolted to a polished Chevrolet Performance intake. It rests underneath a slick-looking hand-fabricated air cleaner by Josh Bailey of AHRS. What started out life as a vintage dual-quad 409 air cleaner from the early '60s is now turned into a custom-made modern-day cowl induction. Barillaro Speed made the polished stainless steel headers, and the remainder of the exhaust system is comprised of Borla stainless tubing and their Pro XS mufflers.





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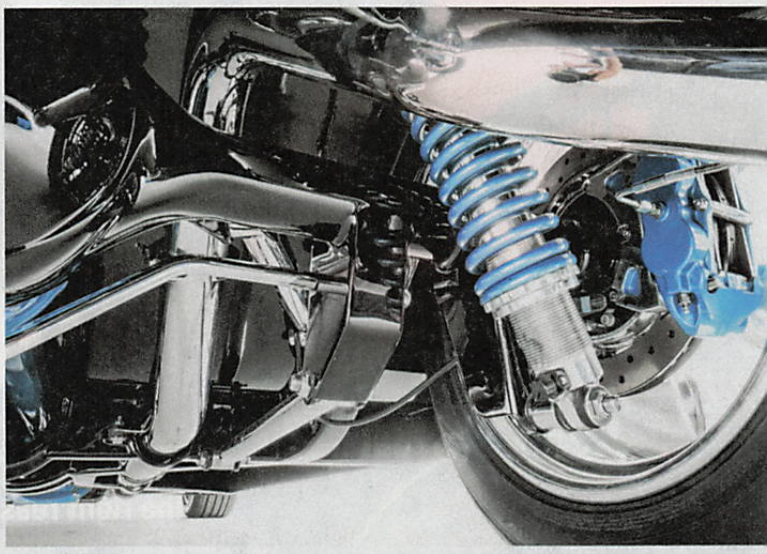
EBONY ICON

More underhood brightwork comes via a Vintage Air Front Runner drive system fitted with a Powermaster alternator, plus a Wilwood polished master cylinder is also pressed into service. Dan's Polishing Shop in Adamsville, Tennessee, gets the thumbs-up for all the AHRS project's brightwork. The engine's mega power is moved rearward by an American Powertrain prepped Tremec TKO five-speed utilizing an AP shifter and a McLeod clutch.Holding all this performance to the ground is the responsibility of the Art Morrison Enterprises chassis that's specifically narrowed in the front and the rear for this application. Up front is an Art Morrison independent front suspension fitted with Wilwood Pro dropped spindles, Wilwood hubs, rotors, and calipers. Strange Engineering supplied the coilover shocks, and the Detroit Speed rack-and-pinion steering is twisted into shape by an ididit tilt column topped with a 15-inch leather-wrapped three-spoke steering wheel from Lecarra by Lokar Performance. In back, the Currie 9-inch rearend is fitted with 3.70 limited-slip gears, 31-spline axles, and an Art Morrison Enterprises four-link and Panhard bar.



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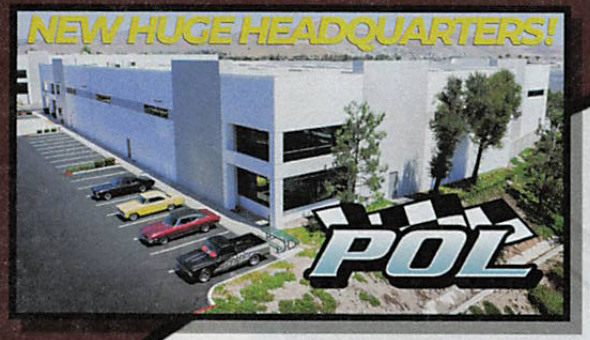

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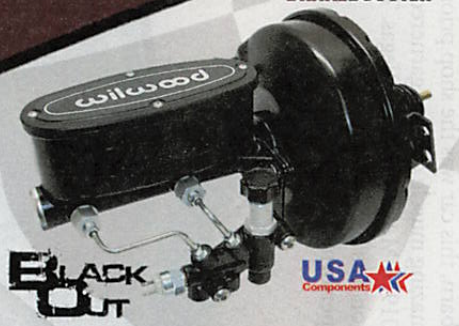

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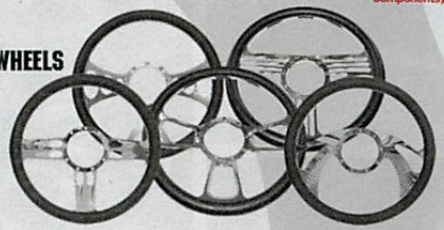
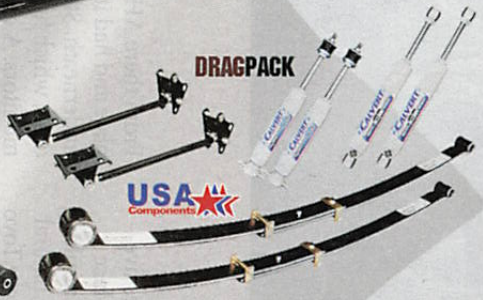


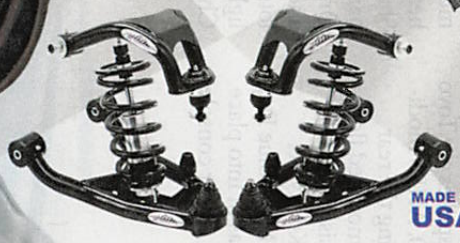
SWAYBARS

DRAGPACK



STEERINGCOLUMNS

TUBULARCONTROLARMS/COILOVER



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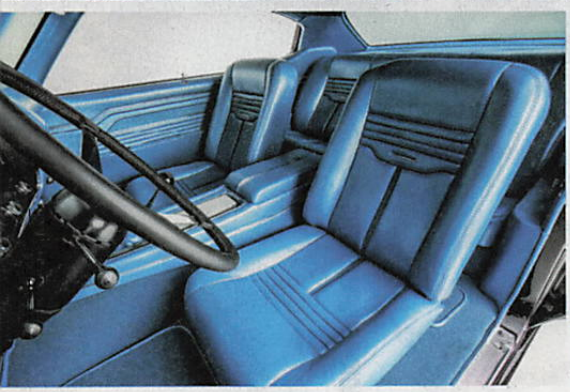

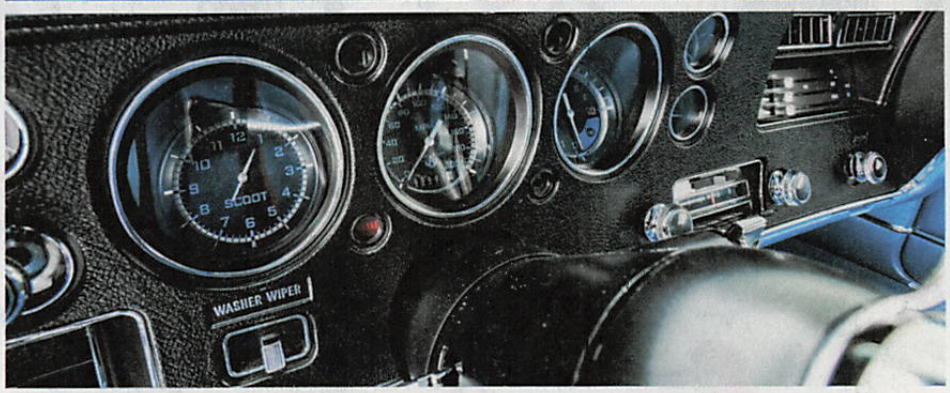

EBONY ICON

The body and chassis package rides on Billet Specialties five-spoke wheels made especially for this car. These in-your-face wheels measure 17x7 in front and 20x10 in the rear. The resulting "rubber rake" gives this vintage LSX-powered Chevelle a natural muscle car stance. Wrapped around the polished spokes are Toyo Proxes tires measuring 225/50R17 and 265/50R20. AHRS modified the pair of Recaro bucket seats while fabricating the rear bench, which was required because of the highly modified floorpan necessary to wrap around the Morrison chassis. From here Steve Holcomb of Pro Auto Custom Interiors, of Knoxville, Tennessee, was responsible for the stitchwork. Le Mans Blue Daytona Weave is used for the carpeting, and it too was fit into place by Pro Auto. Steve also made the stock-appearing center console. From there AHRS took what would have been the four-speed shift plate and had it modified to reflect the five-speed that now resides underneath. Steve also leather-wrapped the stock-appearing metal dash, which houses the custom-made Classic Instruments engine monitors. A cool breeze blows by way of the Vintage Air A/C and heat system while the wiring throughout was connected by Glenn Shabbas of AHRS. The yearlong project began after Rice found the bare metal vintage 1970 Chevelle resting nicely in AHRS storage. Once pulled to the front of the barn, this car was the shop priority and was transformed into an amazing muscle car that garnered lots of looks and praise at the 2019 SEMA Show in Las Vegas. The lights of the Strip have nothing on this LSX-powered 1970 Chevelle sporting all of today's performance. HR

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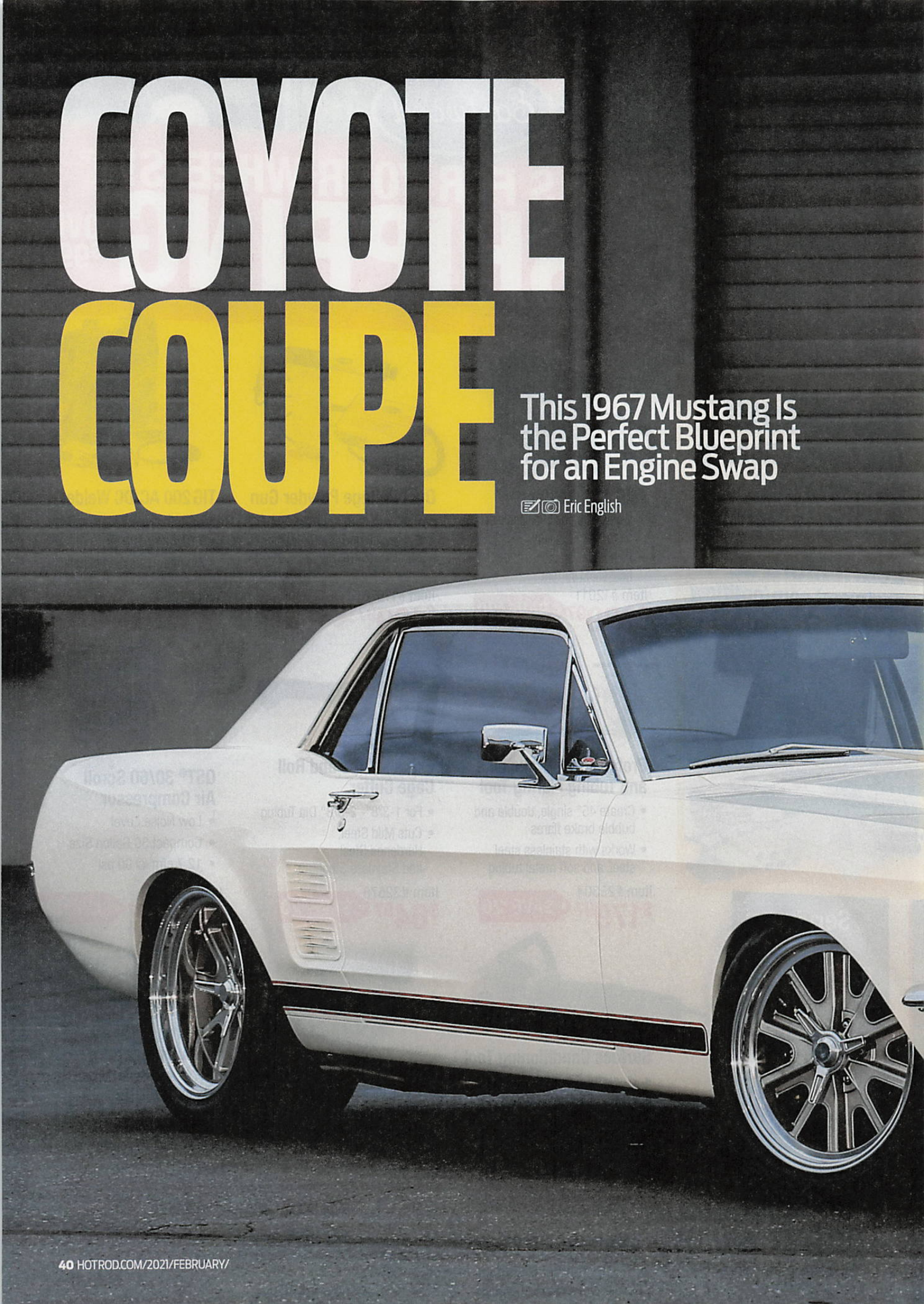
COYOTE COUPE

This 1967 Mustang Is the Perfect Blueprint for an Engine Swap

Eric English



To hear owner Byron Tudor tell it, he hasn't traditionally been a Mustang sort of guy. In that regard he resembles a multitude of car enthusiasts who, whether they love it or hate it, have simply never owned an example of Ford's legendary pony car. Nevertheless, credit Byron for capitalizing on a good thing when it came his way.

The good thing we speak of is the 1967 coupe that was given to Byron by his girlfriend's sister, Holly. Holly had driven the plain white coupe for a number of years before parking it in the late '90s due to its declining condition and concerns regarding reliability. After having it sit in her garage for nearly 20 years and concluding she was unlikely to get it back on the road, Holly offered it to Byron—free of charge. It was important to Holly that her Mustang go to a good home.

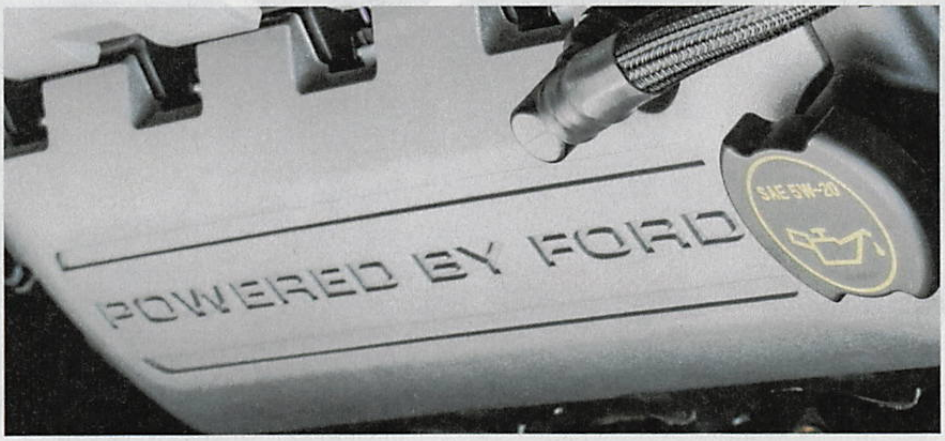
Obviously Byron was happy to have the solid but tired 1967 dropped in his lap, but what to do with it? Coincidentally, Byron had known Craig Wick for a few years; the two were involved in go-kart racing in the Pacific Northwest. Craig is the owner of Wicked Fabrication in Auburn, Washington, one of the area's premier builders of custom and modified cars. Before long, Byron's vision for his dream car was beyond his personal abilities, but with business booming in the aircraft industry, he did have the opportunity to work massive amounts of overtime in order to fund a professional build, so he turned the car over to Craig and his team.

COYOTE COUPE

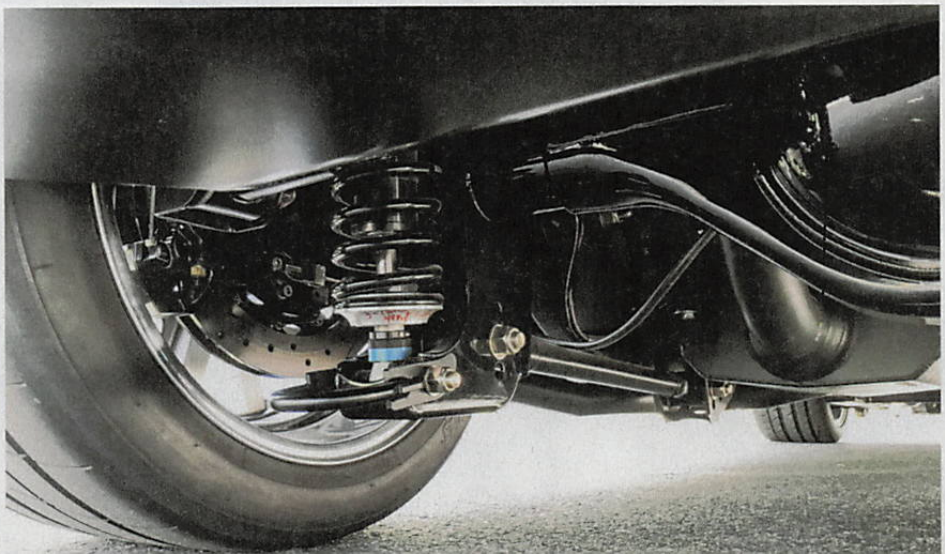
Craig ordered a new 5.0L Coyote crate from Ford Performance, knowing its 435 hp being plenty for a fun street machine. A Coyote swap in any intermediate Ford from the '60s requires removal of the imposing factory shock towers where the coil spring and shock ride above the stock upper control arms. This in turn dictates an aftermarket suspension system, which in this instance is Detroit Speed's Aluma-Frame front cradle/suspension, which can be ordered to accept a Coyote, or a variety of other powerplants. Once the shock towers were removed and the Aluma-Frame setup in place, Detroit Speed shock tower delete panels were welded in place for a near-factory appearance.

Fitting a T56 six-speed from a 2008 GT500 required reshaping the transmission tunnel for clearance, which was eventually topped by a custom-fabbed console. Likewise, more transparent metalwork comes in the form of Detroit Speed's Mustang mini-tubs, which will pass for stock to the casual observer, and yet allow for some serious rubber thanks to 2½ inches of extra clearance.

Craig describes the Coyote swap as a "piece of cake, but that's because, at Wicked Fabrication, he's done nearly a dozen Coyote and Modular engine swaps into vintage Fords. Even better news for the rest of us, however, is that this statement is a reflection on the state of the aftermarket support for such a swap. While it's not at LS proportions, virtually everything you need to swap the most modern 5.0L into a vintage Ford intermediate chassis is available for order. Little to no custom work is really necessary at this point, but it all comes at a price. If you're looking to shave some dollars from the cost of the prebuilt items, you'll need to be resourceful and particularly skilled. One possibility is an F-150-sourced Coyote, which is significantly less money than its Mustang or crate counterparts. It's even possible to bolt up this engine to some vintage transmissions, such as a C4 automatic or T5 five-speed, economizing the operation if you've already got yourself a solid trans or waiting for your budget to catch up.



Stock 5.0L Mustang factory tubular manifolds aren't usually friendly to a vintage Mustang chassis. Ford Performance sells cast-iron manifolds (M-9430-SR50A) from



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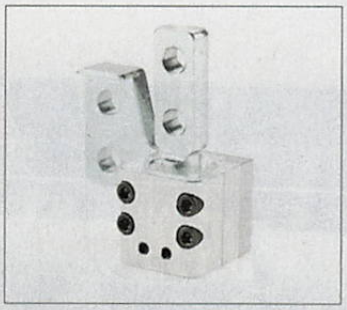

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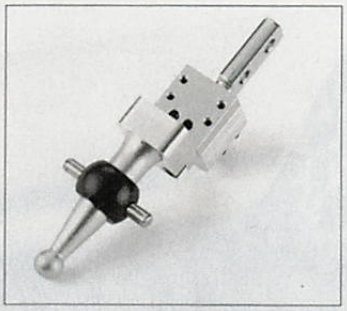

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the F-150 that may work on certain street rods, but we know most builders will opt for aftermarket headers. With many suspension options to choose from, no header will be guaranteed to fit, however, Doug's Headers sells a vintage Mustang Coyote swap header advertised to fit some of the popular Mustang II architecture swap suspensions. Detroit Speed also sells Coyote swap headers specifically designed to clear their own Aluma-Frame front suspension.

To control the engine, you have a few choices, including products from Ford Performance, ACCEL/DFI, FAST, and others. In a mostly-stock Coyote swap, Ford Performance's Control Pack makes a lot of sense, and Wicked Fabrication has used it successfully on several occasions. The virtually turnkey system works very well and incorporates the factory's variable valve timing, though it doesn't have the tuning capacity of some of the other aftermarket systems—likely a concern on heavily modified 5.0Ls.

From the factory, the Coyote use electric power steering, but a number of companies offer a bracket that allows the use of a conventional hydraulic pump. Wicked Fabrication used Vintage Air's Front Runner drive system with a Detroit Speed alternator relocation bracket for Byron's Mustang. Both Canton and Moroso offer swap-friendly oil pans, and Craig likes the radiator and fan combo from C&R Racing, which also includes a built-in engine oil cooler that goes one better than a factory Boss 302 heat exchanger.

In the end, though, you could say that Byron's coupe does it right in virtually every aspect of a Coyote swap. It's got quality components, exemplary craftsmanship, no shortcuts, and has benefitted from a sharp eye for form and function. Better still, Byron is the kind of guy who isn't content to let his dream car collect dust in a hermetically sealed display. On the contrary, he's driven it extensively, the longest excursion being a 600-mile round trip to Spokane. Byron looks forward to other road trips and is planning to test the car's mettle in some autocross events, as well. "Driving this car regularly is the culmination of why I did what I did. The Coyote is so powerful and yet so smooth and comfortable to drive, I think it's the perfect blend of vintage and modern." HR

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Simple EFI Conversion Fuel Tank for Mopars

Adding electronic fuel injection to any older car is a good upgrade, and it is easier than ever to accomplish now. However, as simple as the bolt-on, self-learning EFI kits are to install, you still need to address the fuel system that feeds it.

Johnny Hunkins Chris Arriero

To get all the benefits of fuel injection, and to ensure the fuel system components work efficiently, the fuel pump should be immersed in fuel inside the tank, and there are several reasons for that. The fuel cools the pump, keeping it from burning up and needing replacement. High-pressure pumps like the kind used for EFI don't do a good job of sucking the fuel—they work best when pushing it uphill. Noise is also an annoyance with an external EFI fuel pump. As most vintage fuel tanks had no provision for drop-in fuel pumps, this used to require hanging a pump outside and below the tank. Fuel tank manufacturer, Tanks, Inc., solved that problem years ago by developing EFI-ready fuel tanks for a variety of classic car applications.

Recently, Classic Performance Products (CPP) developed several fuel system packages for applications for which Tanks Inc. makes a fuel tank. In addition to the fuel tank, you get a 255lph EFI fuel pump, fuel sending unit, in-line filter, a custom in-tank hanger assembly, –AN6 fittings, and push-lock style fuel line. This effectively converts any fuel system to ⅜-inch ID fuel line (up from 5/16-inch), while putting a lid on loud, exposed EFI pumps. It supports up to 600 hp (naturally aspirated) and can be ordered with a variety of sending units to suit the impedance of your gauge's circuitry. Once installed, you'll have a fuel tank that looks stock and that keeps the loud whine of an EFI pump at bay.

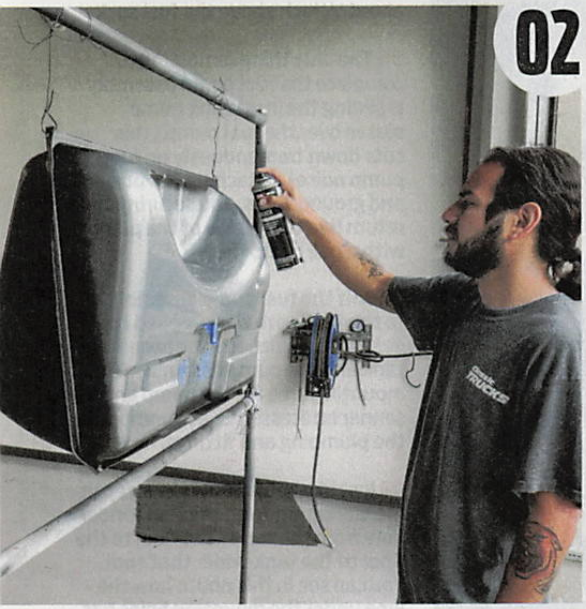
Thinking this was a good idea, we searched around for a vehicle to install one of these systems into. We didn't have to look far, because our resident wrench-turner Christian Arriero was in the process of finishing up his 1974 Duster. Under the hood is a carbureted Magnum 360 engine, meaning it's a newer block with no provisions for a mechanical fuel pump. He could obviously benefit from this package from Tanks Inc. and CPP, and should Chris want to replace his old fuel mixer with EFI someday, he only needs to change the regulator. Let's take a look at how Chris installed the CPP fuel injection tank kit in his 1974 Duster.

Sources

Classic Performance Products; 714.522.2000; classicperform.com

Tanks, Inc.; 877.596.3842; tanksinc.com

01



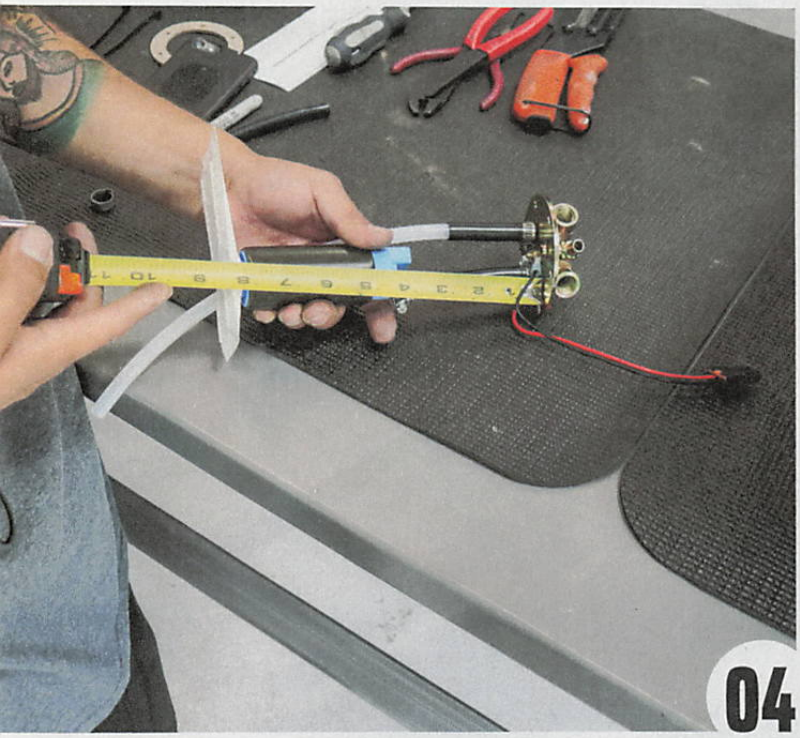
02

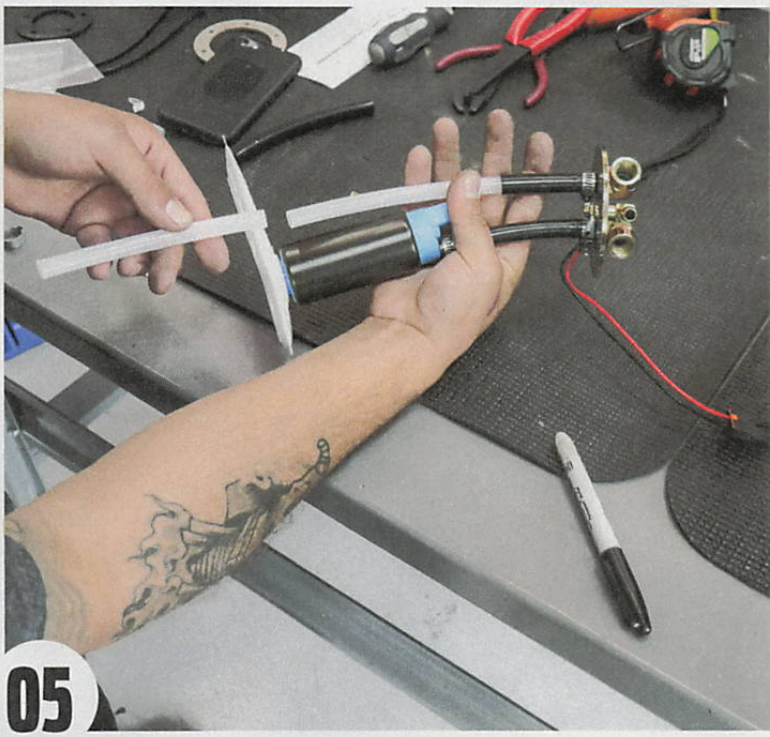
03

01 This is CPP's kit for 1970-76 Mopar A-Bodies (part No. MO7076CFIT-K, $455). It includes a Tanks Inc. fuel tank that is not only A-Body specific, but also has provisions for installing an in-tank EFI fuel pump. The CPP kit also includes an EFI-specific fuel pressure regulator (*shown*), which Chris replaced with a low-pressure, carb-specific unit.

02 Before installing anything, Christian sprayed the tank with SEM's Trim Black to protect the metal and maintain a stealthy appearance under the car.

03 The fuel pump hanger in the CPP kit needs to be trimmed to the depth of the fuel tank. Before you trim the fuel pump hanger, you'll need to take a depth measurement from the fuel tank's top surface to the bottom of the tank.





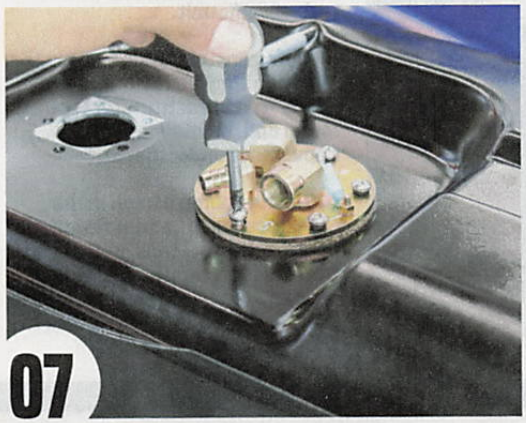
04 05

06

04 Chris transfers the tank depth measurement to the bottom of the fuel pump assembly to a corresponding depth that puts it about 1/4 inch off the floor of the tank. With that position established, you'll want to note the length between the bottom of the pickup mounting flange and the outlet boss on the fuel pump. This is how short the fuel supply hose needs to be cut. Here, that's about 3¾ inches.

05 With the fuel supply hose cut and attached to the fuel pump assembly and fuel pump (all included), it's time to attach the return hose to the fuel pump assembly and cut it to length. This hose should ideally terminate about 1/2 inch above the fuel sock.

06 The only thing remaining to complete the fuel pump assembly is sliding the insulating pump sleeve over the fuel pump (this cuts down tremendously on fuel pump noise), attaching the power and ground wires, and securing the return line to the side of the pump with a pair of zip ties.



07

08

07 Bolt the fuel pump assembly to the tank with the supplied cork gasket sandwiched in between the tank and the pump assembly. The mounting area for the pump and sender is recessed to accommodate the plumbing and fittings.

08 Just like the pump, take a depth measurement from the fuel sender hole from the top of the tank to the floor of the tank under that spot. You can see in this photo how the area under the mounting holes has been reinforced from inside with extra metal.

09 CPP's instructions include a chart to determine where to place the float's pivot point, based on the measured depth of the tank. This will produce the desired range of motion for the float as it traverses its complete range of motion.

10 Similar to mounting the fuel pump assembly, drop the sending unit into the tank with the gasket sandwiched in between. It mounts in only one orientation, so you can't get it wrong.

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11

12

13

11 CPP includes all the anodized AN fittings for the send and return fuel lines. Here, Chris coats the threads of the -6AN-to-NPT fitting with ARP thread sealer before threading it into the fuel send port on the fuel pump assembly. The return fuel line fitting is identical.

12 You'll want to attach the chassis ground to the fuel pump flange before you get the tank in the air and under the car. That way, you'll only have to shorten the ground wire and attach it once the tank is under the car. Now's also the time to attach the sending unit signal wire and the fuel pump 12 volt power wire to the in-tank pump. Those will also be terminated to the car once the tank is installed.

13 It's important to plumb the pressure vent valve prior to installing the tank. This one-way check ball allows venting negative pressure without leaks, and for Chris, that means he can use a non-vented gas cap, which he needs because he's moving the fuel filler neck inside the trunk. Note that there are two vents on the tank, which must be connected in a "Y" with the hose and fittings included in the CPP kit. The pressure relief valve must be placed above the level of the fuel filler neck to prevent spillage.

14 With the plumbing and wiring complete, Chris raised the tank into place to plan the routing of the fuel lines.

14

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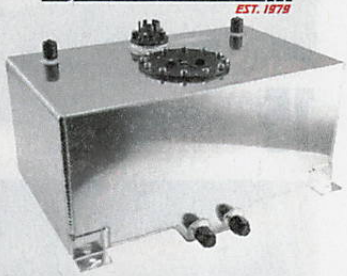

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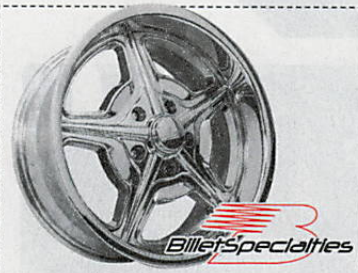

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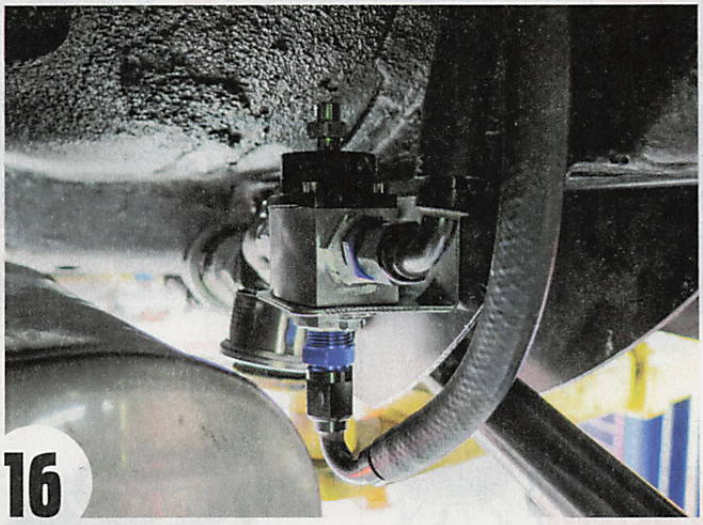

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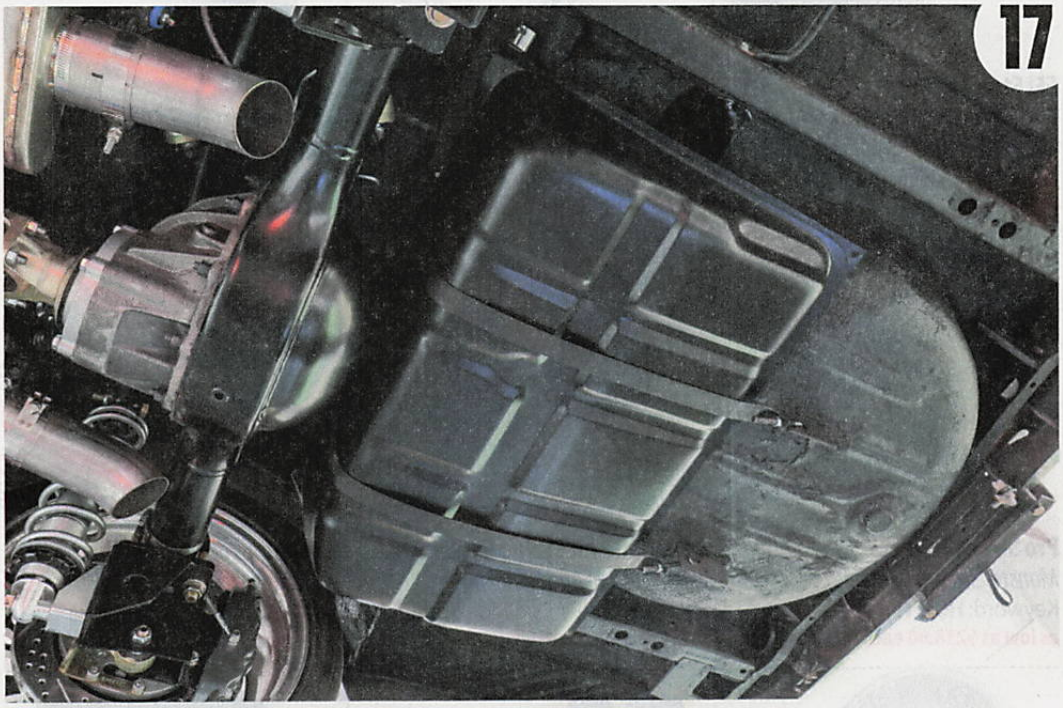

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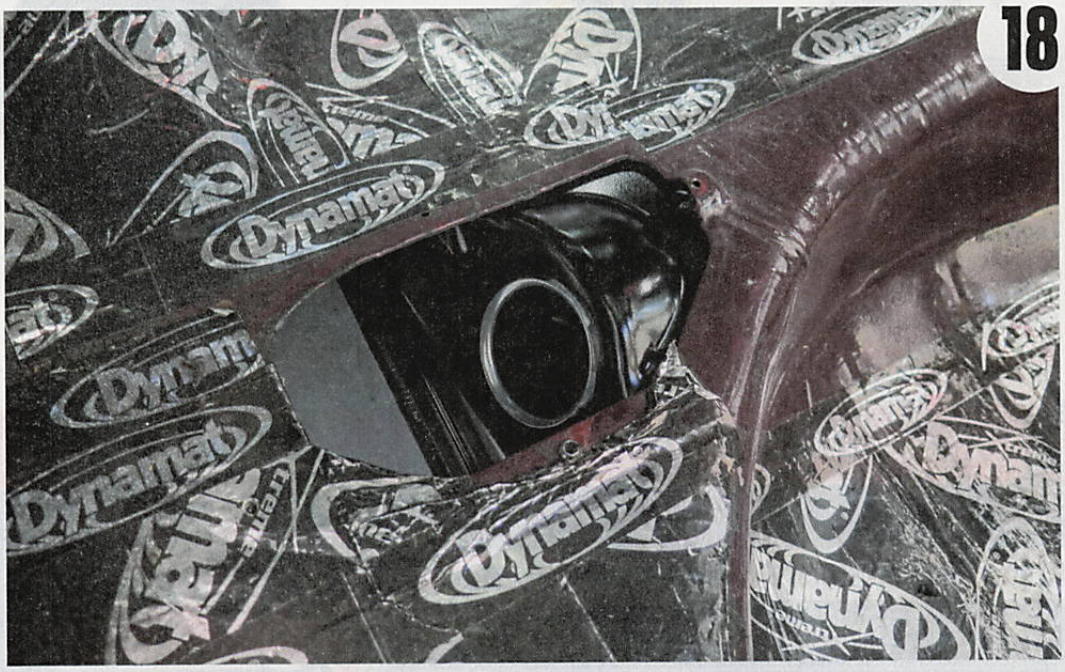

18

15 As you run your push-lock fuel hoses to the front of the car for measuring and installing the AN fittings, it's a good idea to mark the lines with "R" and "S" for "return" and "send." That way you won't accidentally mix them up and get the lengths wrong. We'll point out that –AN6 line is $^{3}/_{8}$ inch in diameter, which is a lot larger than the stock $^{5}/_{16}$-inch line. That allows it to carry a lot more fuel for thirsty engines. This will be plenty for the 455-hp Magnum 360 it will supply.

16 As mentioned before, Chris' Duster has a carbureted engine, so the high-pressure regulator included in the CPP kit was replaced with a low-pressure Mr. Gasket regulator (part No. 2015). Chris likes to mount this regulator near the tank. This shortens the return line hose run, helping to reduce fuel heat soak and vapor lock. You only need to make the pressure adjustment once, so the location inboard the rear framerail is nice and safe.

17 After routing the fuel lines and wiring, it's OK to bolt the fuel tank straps on. Chris says, "See how awesome it looks now!"

18 One thing Mopar guys universally don't like is the giant filler pipe cutting through the trunk, reducing the useable area. Chris is going to move his filler access into the trunk when he smooths the driver-side quarter panel. The rubber filler neck boot is removed (they normally are dried out and cracked and need to be replaced anyway); it will be replaced later with some of Chris' slick fab work.

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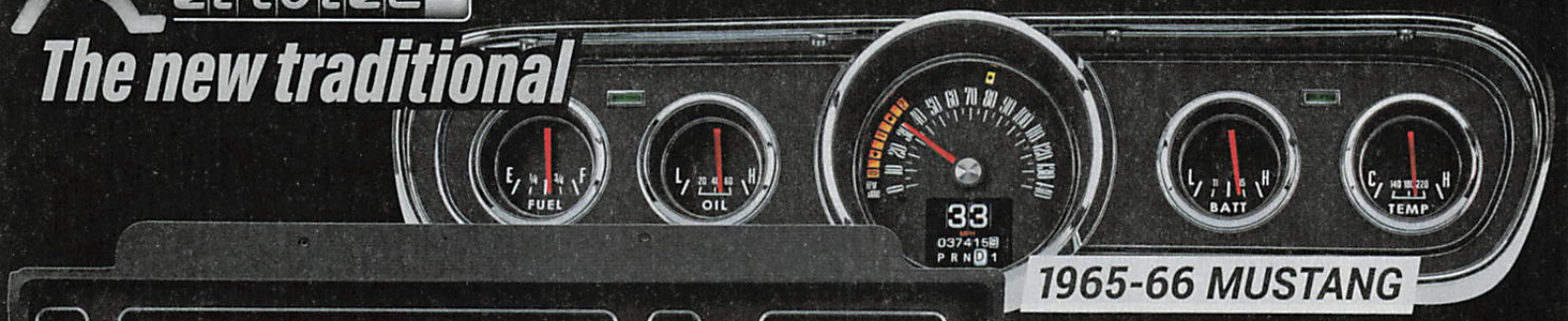
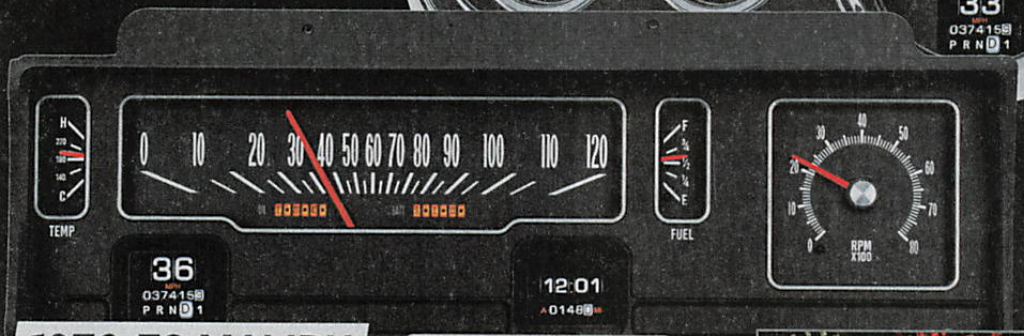


1965-66 MUSTANG



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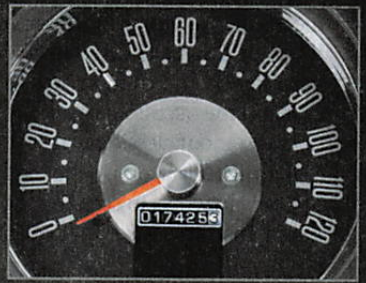

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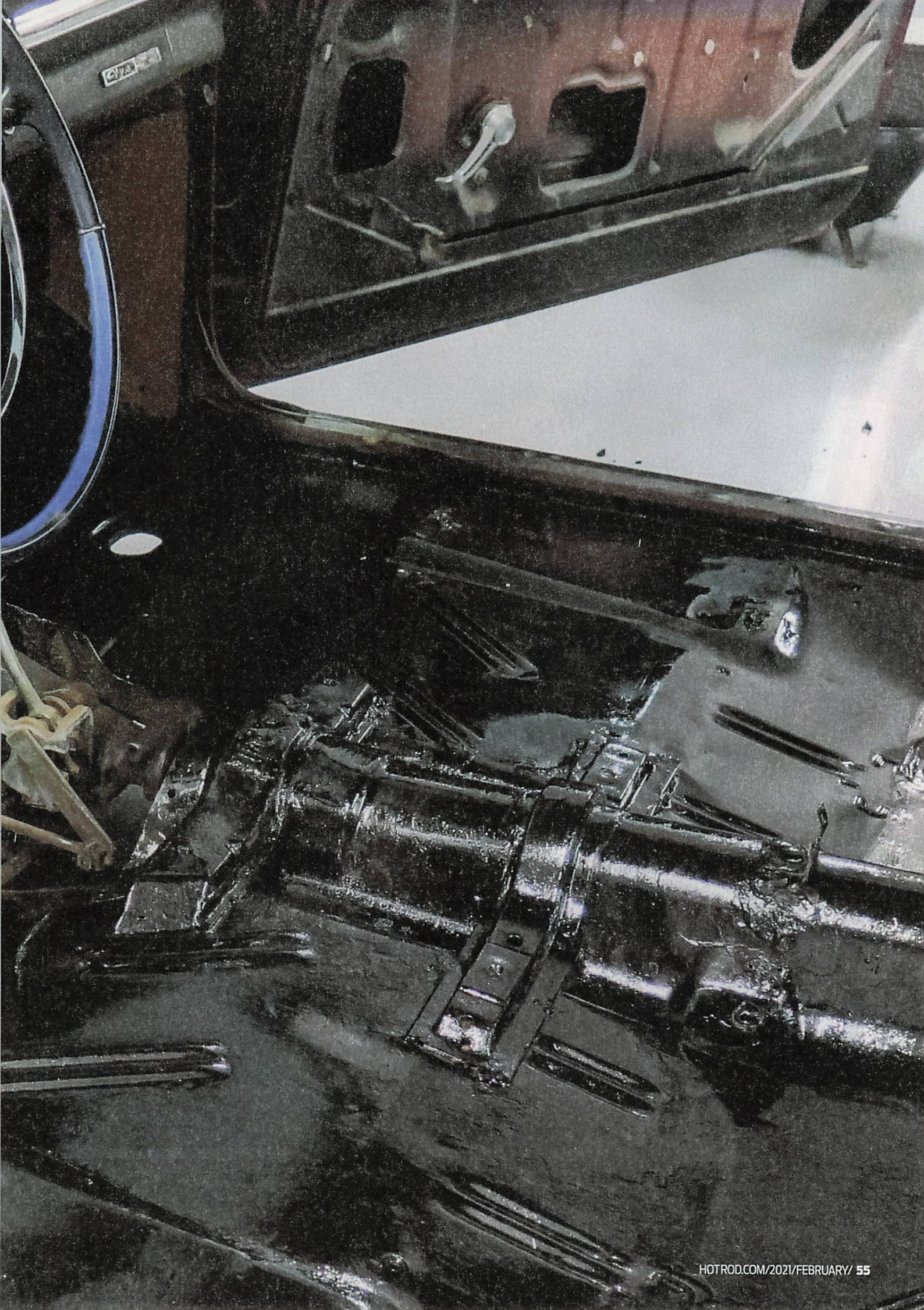
Classic Car Rust Prevention:

How to Seal the Floor Pan of Your Ride with POR-15

So, you bought a "new to you" project car and want to start the build right. That means tearing out the interior and making sure the floor pans are sealed and rust free. If you find Swiss cheese, check out "How to Fabricate and Install Replacement Floor Pans" on hotrod.com on how to replace your floor pans. If you find minor surface rust and the occasional pinhole, keep reading and we'll show you everything you need to know about classic car rust prevention.

If it's just surface rust, the most effective removal process is to simply use a grinder with a wire wheel to clean up the old sheetmetal. Then, make sure you properly seal the floor pans, otherwise you'll quickly end up right back where you started.

Taylor Kempkes Christian Arriero



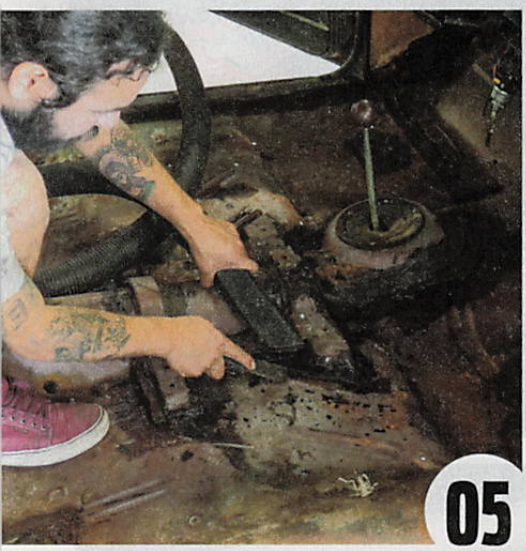
01

02

03

1-3 The quickest way to fix pinholes in your floor pans is applying a sealer like POR-15. Most of the time, like their name suggests, pinholes are very small and non-structural. So all you really need to do is some basic classic car rust prevention and seal up your floor pan from outside elements.
If you find yourself with holes that a dab of sealer can't easily fill, the best choice is to cut the rust out and replace it completely with a patch panel. That wasn't necessary in the case of this Nova, though. Check out how easy the POR-15 process is. We used POR-15 to seal the floor pans of our newly acquired 1963 Nova to get it ready for the rest of the buildup.

04 To begin, Motor Trend Tech Center technician Christian Arriero removed all the interior components of the car, including seats and carpet.



05 Next, Christian scraped off as much of the old sound deadening material and seam sealer as he could by hand.

06 He then sprayed POR-15 Metal Prep on all surfaces to be sealed.

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07 Using a wire wheel, Christian removed all the surface rust.

08 Spray and wipe the floor pans with POR-15 Cleaner Degreaser.

09 Christian used a disposable foam brush to apply two thin coats of POR-15 Rust Preventative Sealer on the Nova's entire floor pan and trunk floor.

10 The product fully cures in five hours. POR-15 forms a solid barrier that prevents further corrosion.

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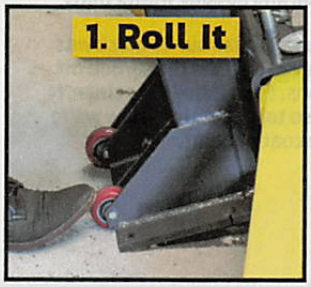

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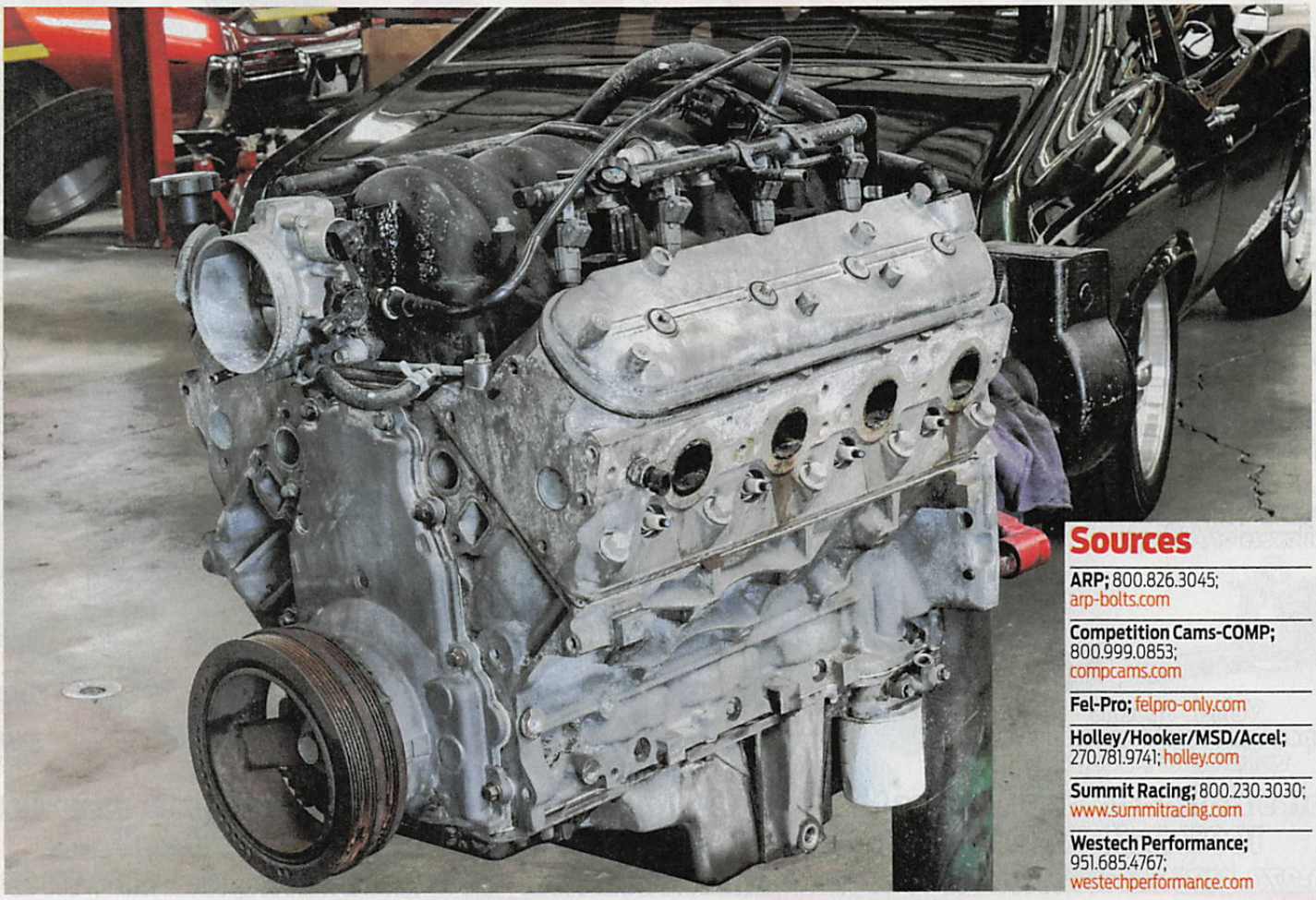

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Competition Cams-COMP; 800.999.0853; compcams.com

Fel-Pro; felpro-only.com

Holley/Hooker/MSD/Accel; 270.781.9741; holley.com

Summit Racing; 800.230.3030; www.summitracing.com

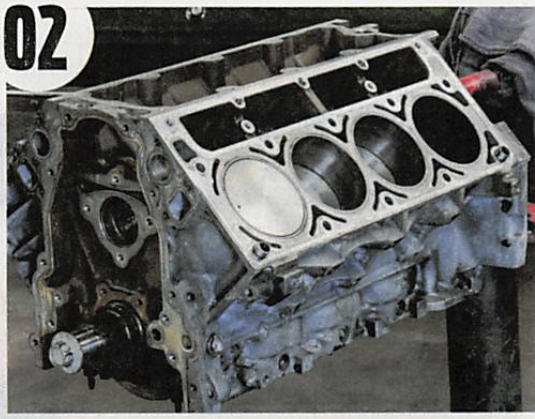
Westech Performance; 951.685.4767; westechperformance.com

Dress it Up

Steven Rupp

HOW TO MAKE AN LS ENGINE LOOK AND PERFORM BETTER

Even with all the LT goodness coming from GM, the go-to mill for engine swaps is still the tried-and-true LS. After all, LS1s and all their variants are turning up more often in wrecking yards. Hundreds of thousands of them out there mean the prices are great, and the LS has amazing aftermarket support. We picked up this LS1 from a wrecked fourth-gen Camaro for just a few grand. We figured with some work and a few parts, it would be perfect for a 1956 Chevy that needed an LS swap. Besides, cleaning up a used LS engine will end up being far cheaper than buying a new crate engine.



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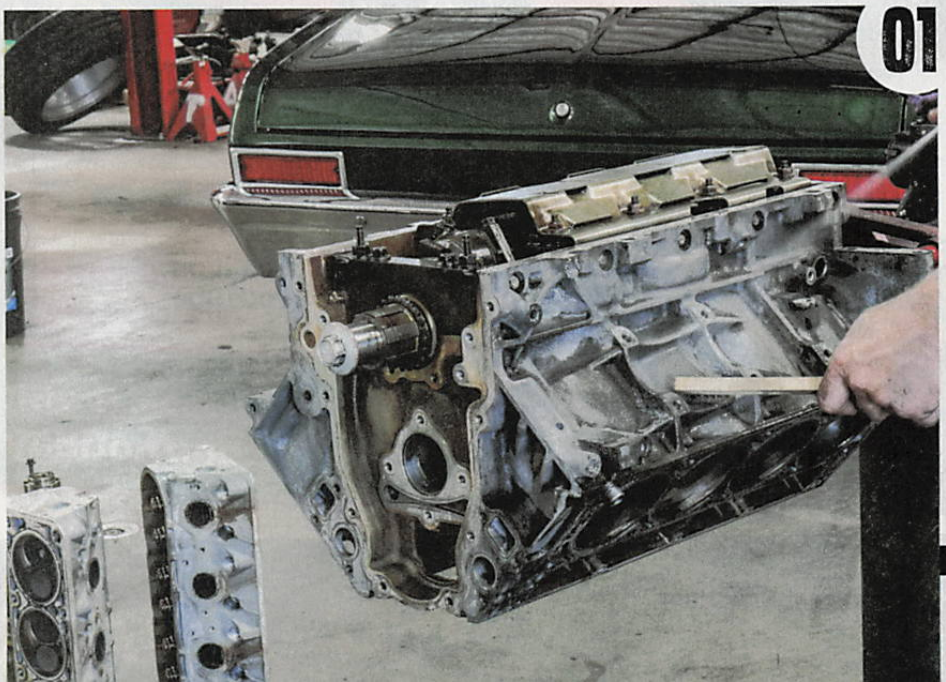
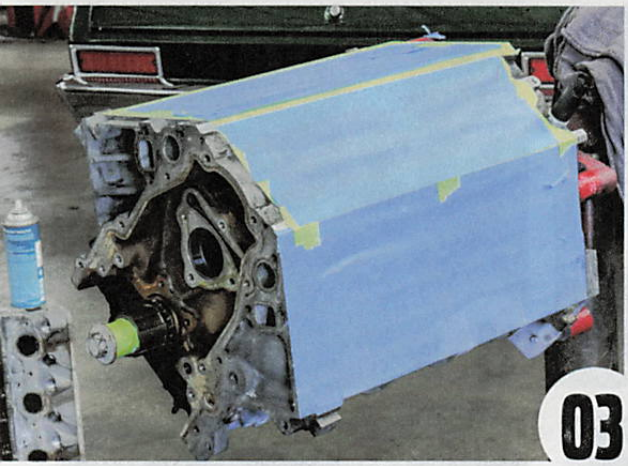


01

01 Junkyard LS-swap candidates are typically filthy and need a deep cleaning before anything can be done to make them look better. We also double checked everything and replaced the head gaskets since it was pretty easy to do at this stage. So, after pressure washing and pulling off the heads, we used a steel bristle brush and a lot of degreaser spray to clean every inch of the aluminum LS block. Remember, if you miss a spot the paint won't stick, and nobody wants that.

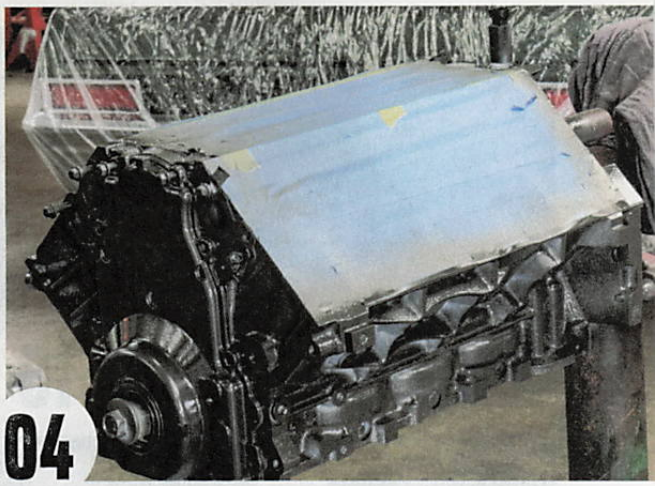
02 After a lot of elbow grease our LS block was squeaky clean. We even cleaned the carbon off the top of the pistons. Even though it's clean, it still looks like hell, so to make it look new we're going to give it all a coat of paint.



03

03 Tape is your friend. You don't want paint in the engine, and taping it all up is easier than trying to clean off overspray. Just like painting a car, the effort you put into the prep will pay off in the final product.

04 Rather than tape off the timing area, we simply put the timing cover on and shot it as well. For a color, we chose a gray called Cast Iron. Multiple thin coats is the way to go to avoid drips and runs. Consider different colors or using contrasting colors for different parts.



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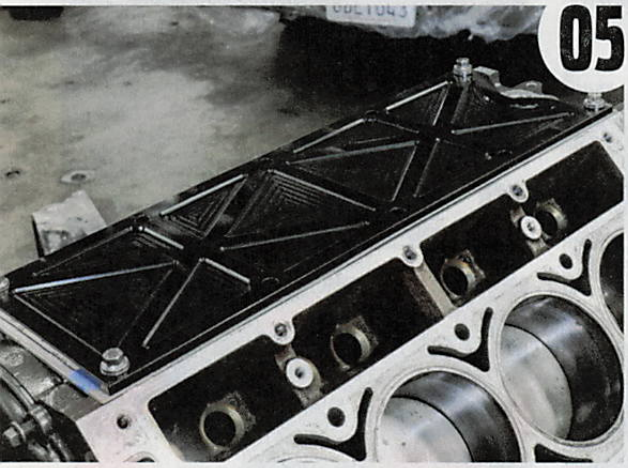
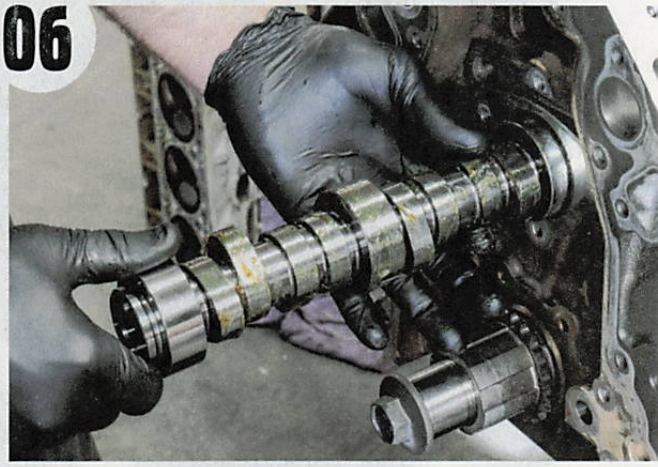


05

05 You could paint the stock valley cover, but ours had holes in it for the knock sensors that we were ditching. A nicer option was this black billet valley cover from Holley. We also grabbed a stainless LS accessory bolt kit from ARP. A few fancy parts and some nicer bolts is an easy way to dress up an LS engine for your swap project.



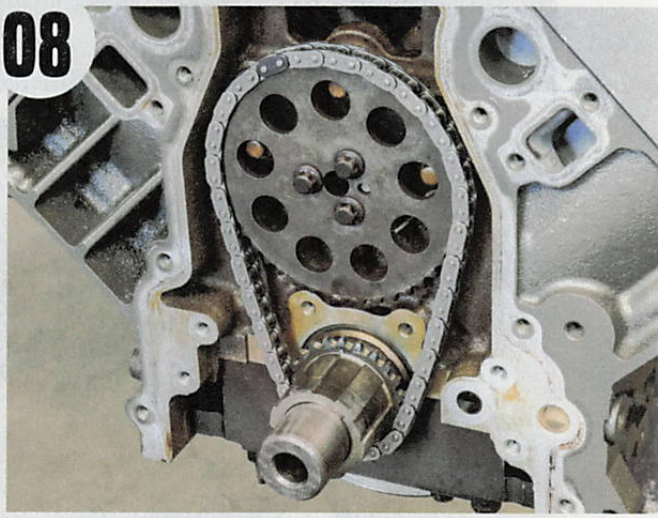
06

06 More power is never bad, right? Well, since we had the engine apart, we opted to slide in a new camshaft from Comp. The Comp stick (PN 54-414-11) we slid in was a 216/220 (@ 0.50-inch) duration with a lift of .525/.532 and an LSA of 114. A bigger cam would make more power, but we were going for balance since the Chevy this was being swapped into is more of a cruiser.

07

07 A new cam meant we needed stiffer springs, as well, so it was easier just to source them, along with new seals and hardware, from Comp. The Comp upgrade kit (PN K54-414-11) includes new lifters (PN 850-16) along with the springs and all the necessary parts for a better deal than buying separately.

08 There was unknown mileage on our LS1 swap engine, so we replaced the timing chain with a fresh one from Summit Racing (PN SME-143012). That's also where we got the Fel-Pro LS rebuild gasket kit.



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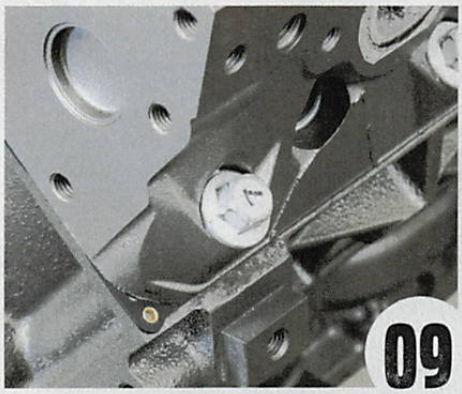

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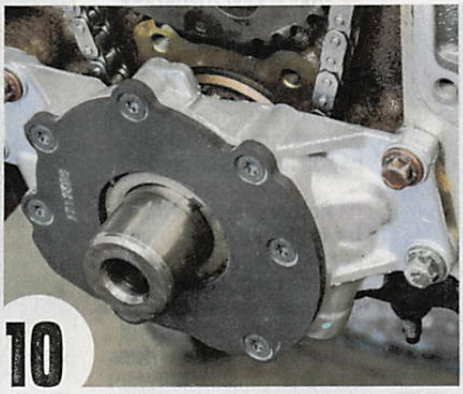

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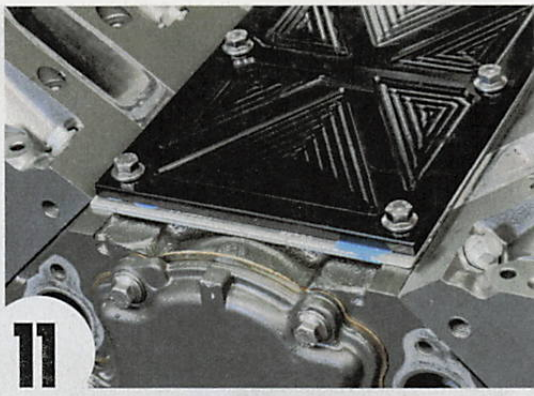

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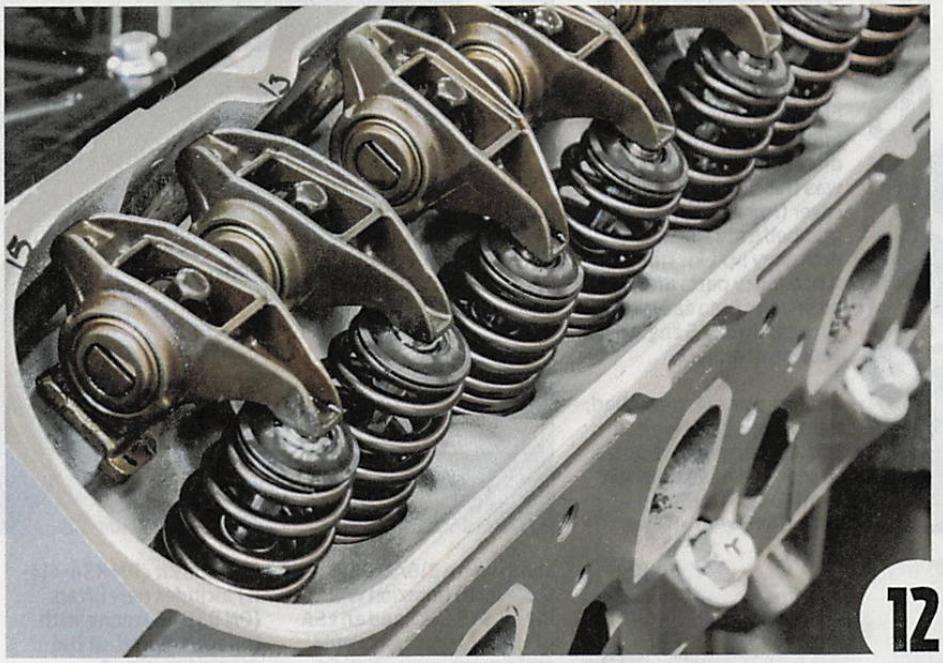

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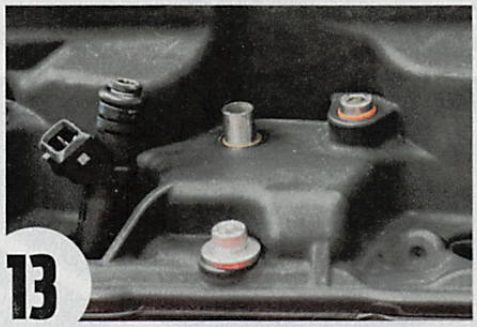

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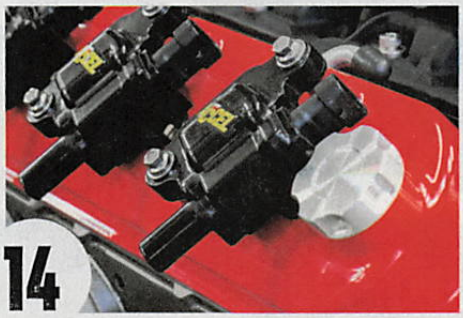

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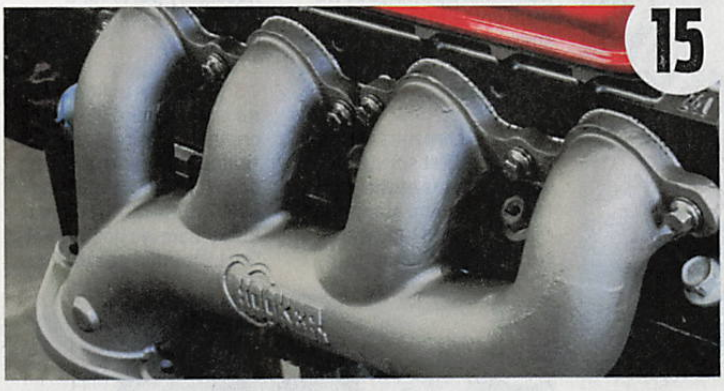

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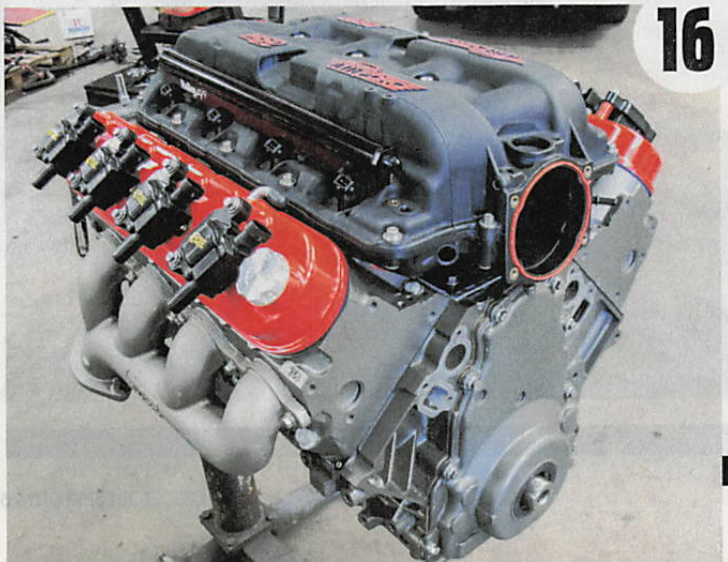


16

09 The gasket kit included new LS1 head gaskets (PN 9284 PT), and we secured the cleaned-up and repainted heads with a set of torque-to-yield head bolts from Summit Racing (PN SUM-910210).

10 There's no reason to go this far and not replace the oil pump given how inexpensive they are. This one is from Summit Racing, and going by the casting marks, it was made by Melling, so it's good stuff.

11 With the mechanical changes done we could start bolting the LS1 back together again. New fasteners, especially the shiny stainless bolts from the ARP kit, really add a nice, detailed touch to a used LS engine project.

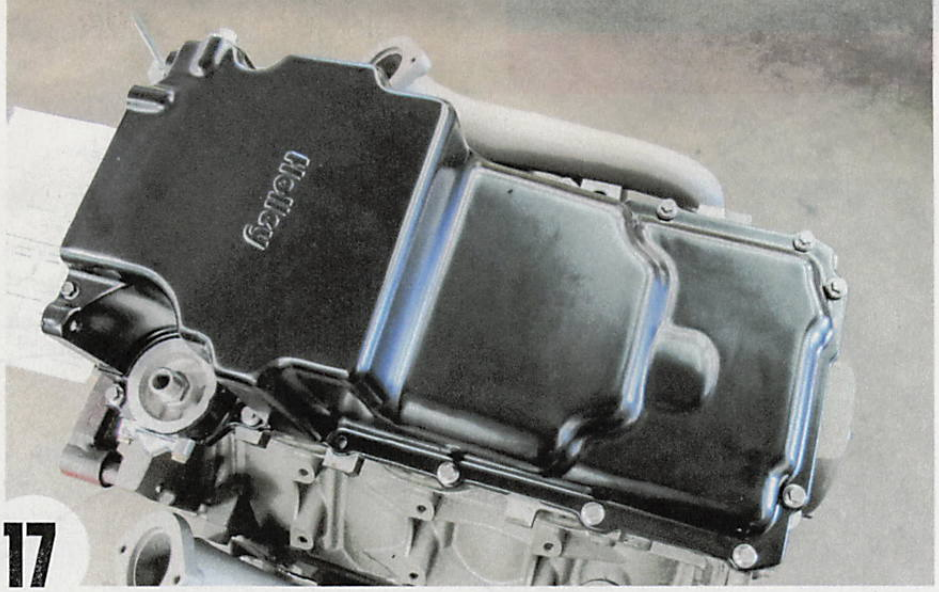
12 Our hot-tanked and worked-over 241 heads looked like new, and since the new Comp springs were already installed, we went ahead and bolted on the LS1's used rockers.

13 We chose to go with MSD's Atomic intake. It's a more expensive option than cleaning up the stock LS1 intake, but it makes more power and looks better. We also wanted to run a pair of Holley fuel rails, but to do this we needed to make these short spacers out of some spare stainless fuel line we had. This way the fuel logs would be the right height to work with the new Fast LS1 injectors. To clear the intake, we also had to clearance the inside edge of the fuel rails from hitting the intake. Holley now makes fuel logs designed to work with the MSD Atomic intakes.

14 Stock valve covers are ugly, and even if you paint them, they are still less than attractive. The Holley tall-LS covers look better, come in various finishes, and have integrated coil pack mounts. We went with red for a pop of color and added a set of new Accel coils along with more ARP stainless hardware.

15 If you make big power, then long-tube headers are the way to go, but we've had great luck with aftermarket iron manifolds such as these from Hooker. A bonus is that they easily fit into the 1956 Chevy this LS will be swapped into. The manifolds even came thermal coated.

16 This LS-swap mill looks a lot better than when we started. But we weren't ready to send it to the Westech dyno quite yet.



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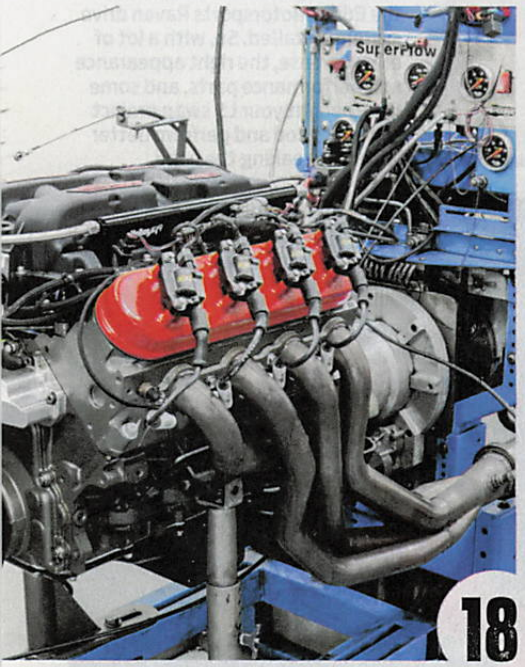
17 Yep, we needed an oil pan. It's rare that the stock-application oil pan will clear whatever car you're swapping the LS into, so an aftermarket pan is almost always needed. This F-body style pan from Holley was one we had from a Camaro project, so we thought it would work. We were wrong. Luckily Holley makes several different pans and had one that was perfect for clearing the steering linkage of our 1956 Chevy. Remember that when changing out the oil pan, you may need to modify or change up things such as the windage tray.

18 Before swapping the LS1 into our 1956 Chevy, we took it over to Westech Performance for some time on the dyno. We used their dyno long tubes rather than mess with making pipes for our exhaust manifolds. For plug wires, we went with a set from Accel that had ceramic boots to resist head damage.

19 Our throttle will be worked with a cable, so we grabbed a Holley Sniper billet throttle body for the swap.



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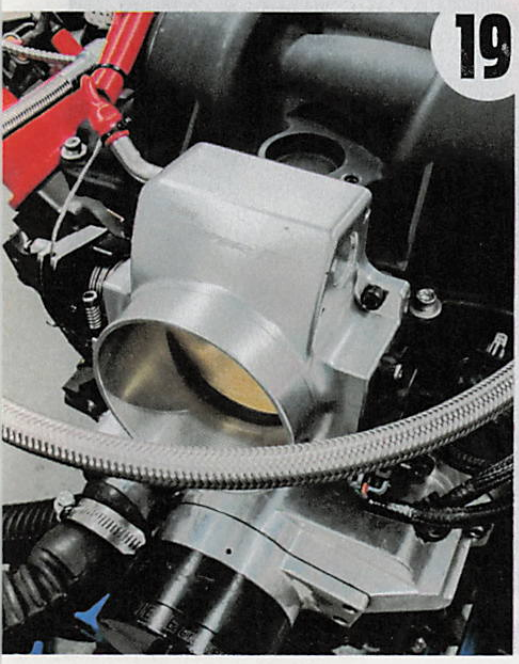

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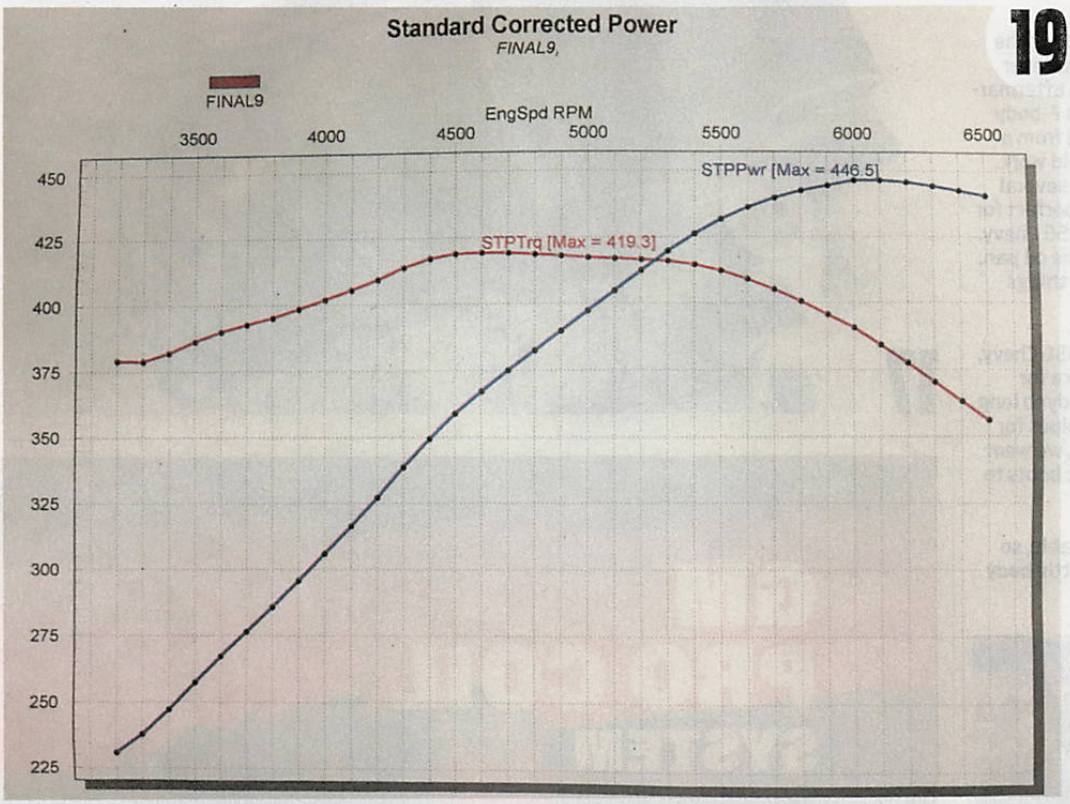
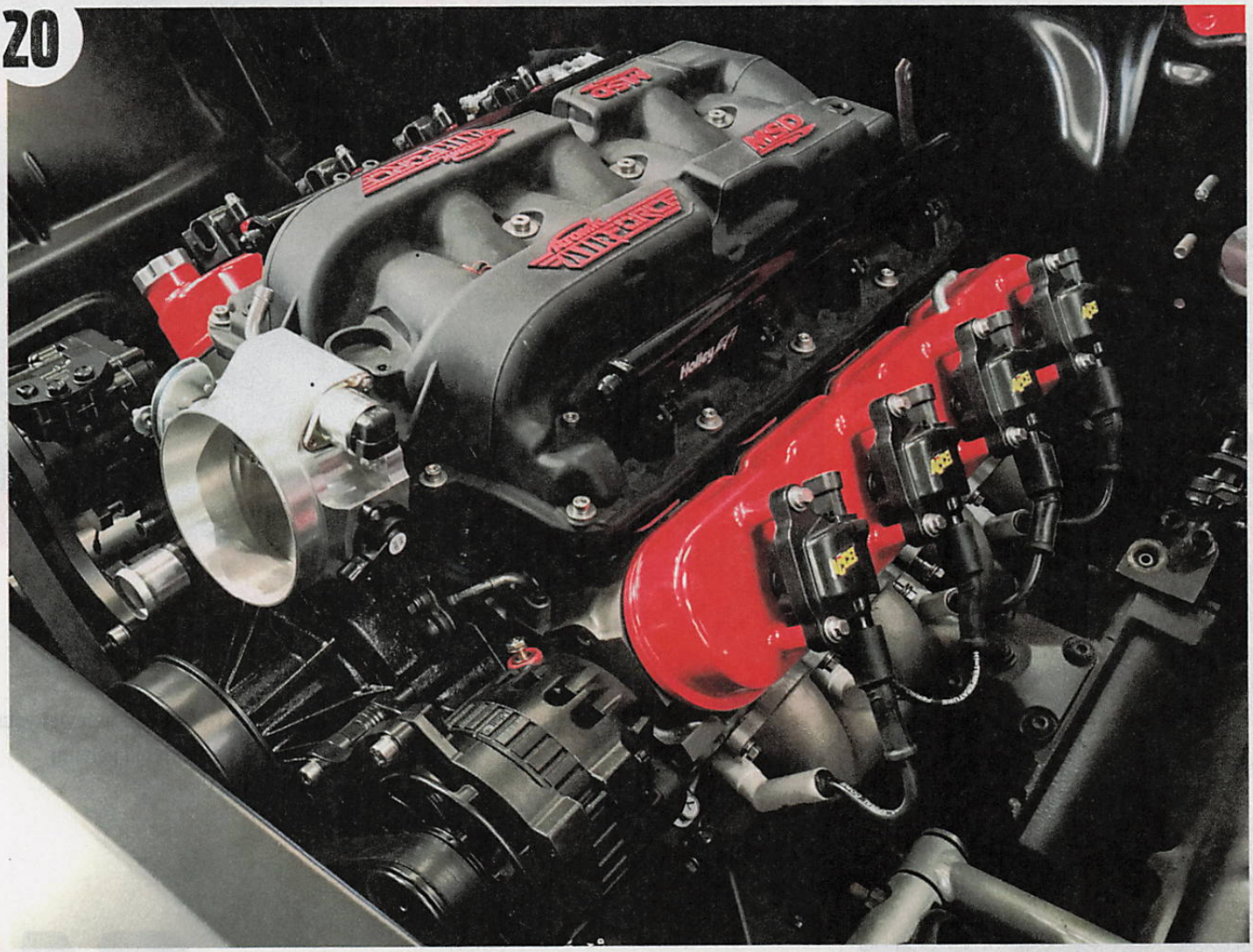


19

19 Our junkyard LS1 put out 446 hp at 6,100 rpm and 419 lb-ft at 4,600 rpm. Record breaking? Nope, but that long, flat torque curve was just what we wanted for our Chevy cruiser project. And 446 hp is more than many later variants of the LS1 makes, including the LS3 in stock form.

20 Who says LS engines have to be ugly? We think this salvaged LS1 looks great in the engine bay of our 1956 Chevy and even better with the Eddie Motorsports Raven drive system installed. So, with a lot of elbow grease, the right appearance and performance parts, and some forethought your LS swap project can look good and perform better without breaking the bank.

20



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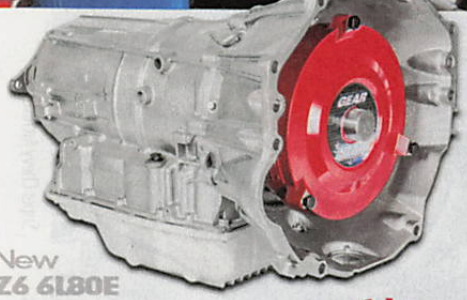

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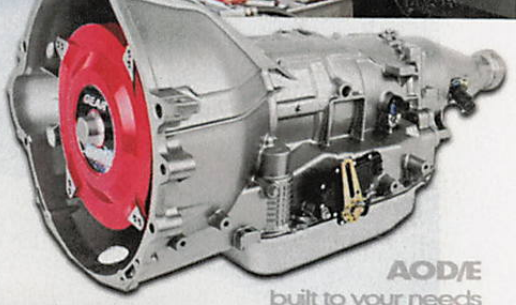

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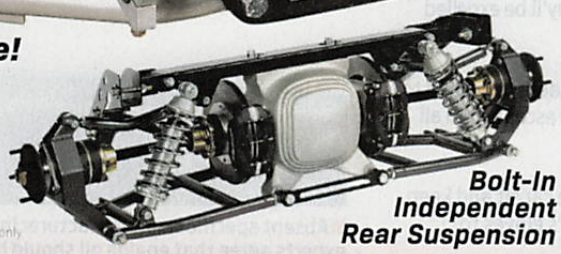

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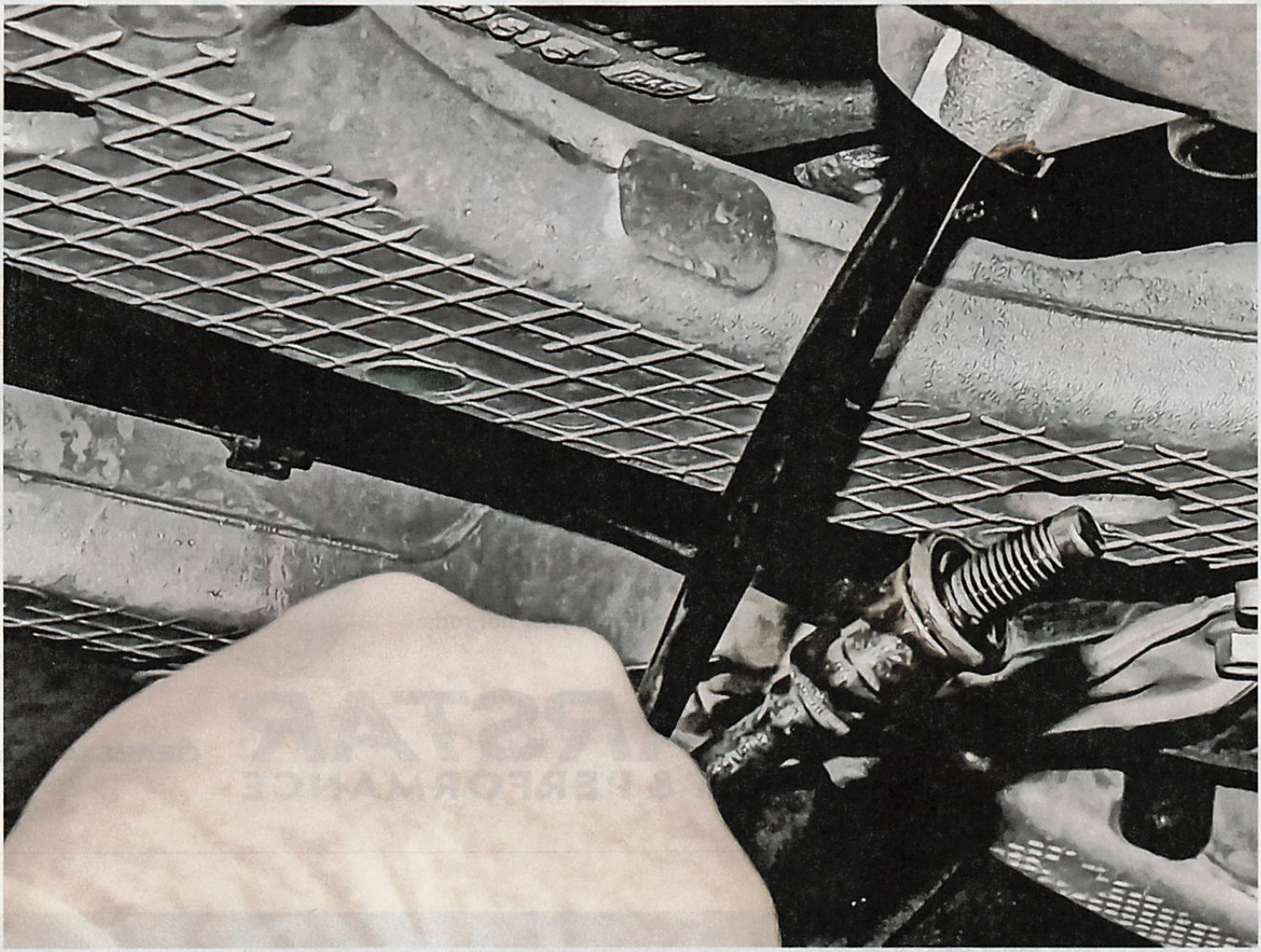

Super Chevy Archives

Below: sshepard via iStock / Getty Images Plus

Is It Better to Change Oil Hot or Cold?

It seems intuitive that if time is not a factor, the most thorough way to change engine oil is by letting the car sit overnight, then next morning allowing the oil to drain out of the sump for several hours. Doesn't that get every bit of old oil out of the car? Isn't it safer to change the oil cold instead of when it's hot, likely over 200 degrees F? Not necessarily. When it comes to the question, "Is it best to change oil hot or cold?" the answer might surprise you.

- Most oil experts say it's better to drain the oil when it's hot instead of when it's cold, for several reasons:
- Oil viscosity is thinner when it's hot, so it drains more quickly and completely out of the engine than when it's cold.
- On a hot engine, contaminants are more likely to remain suspended in the oil than when the oil is cold, increasing the chances they'll be expelled from the engine during the draining process.
- Today's high-tech OHC engines hold oil in a lot more places compared to old-school engines, so it's gotta be warm (and thin) to escape from all those upper-end crevices.

Bottom line: Drain engine oil while it's hot, and let the car sit and keep draining for at least a half hour. Always wear mechanic's gloves to minimize the chance of getting burned.

Absent specific car manufacturer instructions to the contrary, oil experts agree that engine oil should be changed while it's still hot.

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March 26-28	Atlanta	NHRA Southern Nationals
April 9-11	Pomona, Calif.	Lucas Oil NHRA Winternationals presented by ProtectTheHarvest.com
April 16-18	Las Vegas	Denso Spark Plugs NHRA Four-Wide Nationals
April 23-25	Phoenix	NHRA Arizona Nationals
May 14-16	Charlotte, N.C.	NGK Spark Plugs NHRA Four-Wide Nationals
May 21-23	Houston, Texas	Mopar Express Lane NHRA SpringNationals presented by Pennzoil
June 4-6	Richmond, Va.	Virginia NHRA Nationals
June 11-13	Epping, N.H.	NHRA New England Nationals
June 24-27	Norwalk, Ohio	Summit Racing Equipment NHRA Nationals
July 16-18	Denver	Dodge Mile-High NHRA Nationals presented by Pennzoil
July 23-25	Sonoma, Calif.	NHRA Sonoma Nationals
July 30-Aug.1	Seattle	Flav-R-Pac Northwest Nationals
Aug. 13-15	Topeka, Kan.	Menards NHRA Heartland Nationals presented by Minties
Aug. 19-22	Brainerd, Minn.	Lucas Oil NHRA Nationals
Sept. 1-5	Indianapolis	NHRA U.S. Nationals

NHRA CAMPING WORLD COUNTDOWN TO THE CHAMPIONSHIP

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Sept. 17-19	Charlotte	NTK NHRA Carolina Nationals
Sept. 24-26	St. Louis	NHRA Midwest Nationals
Oct. 7-10	Dallas	Texas NHRA FallNationals
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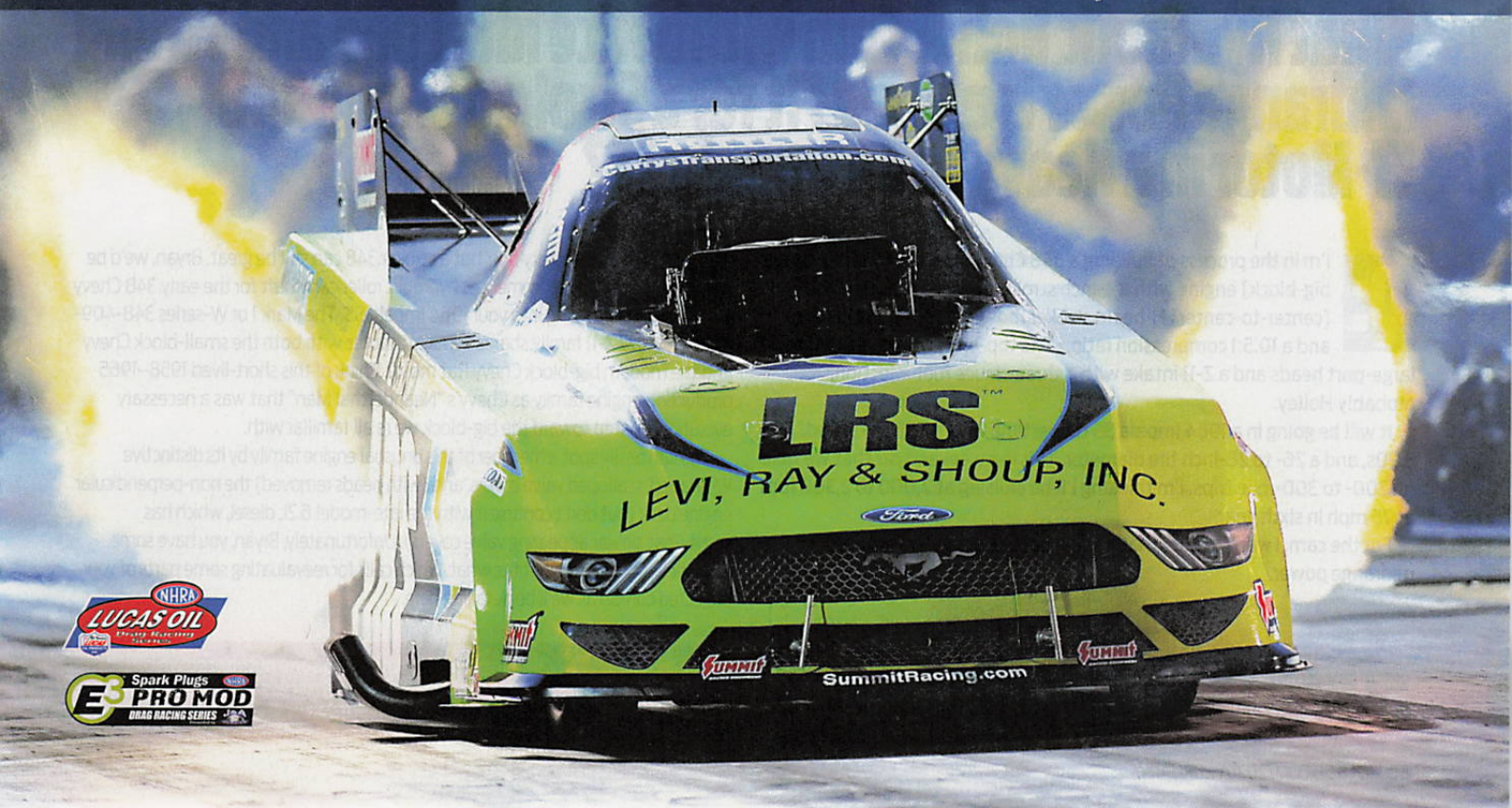
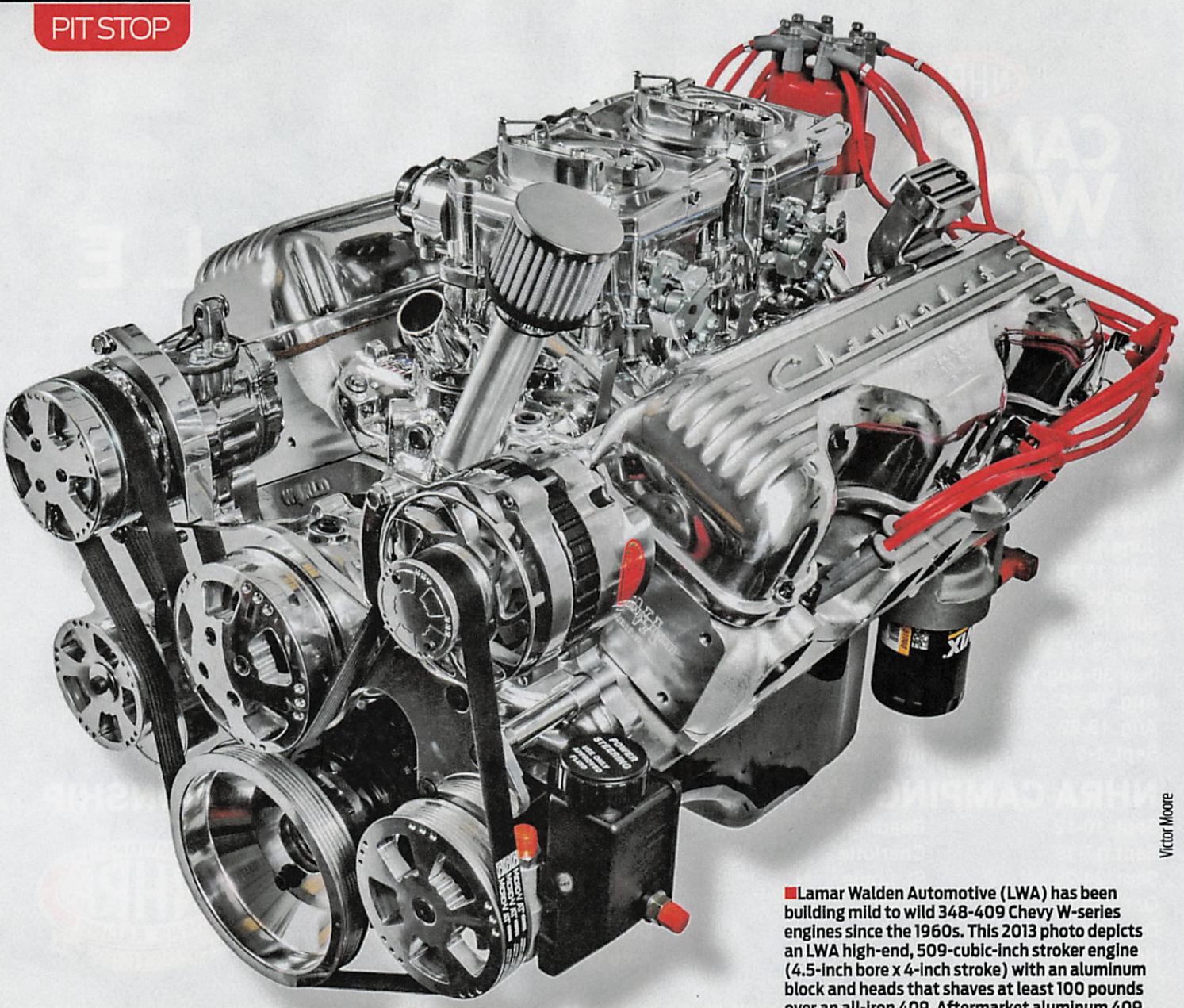




Victor Moore

Lamar Walden Automotive (LWA) has been building mild to wild 348-409 Chevy W-series engines since the 1960s. This 2013 photo depicts an LWA high-end, 509-cubic-inch stroker engine (4.5-inch bore x 4-inch stroke) with an aluminum block and heads that shaves at least 100 pounds over an all-iron 409. Aftermarket aluminum 409 blocks are available through Bill Mitchell.

Reader Bryan Resh asks:

What Hydraulic Roller Cam with a Nice Idle Lope and Strong Midrange Power is a Good Fit for a Stroked Chevy 348 W-Motor in a Heavy 1964 Impala SS?

Marlan Davis

Q: I'm in the process of building a 348 Chevy stroker [W-series early big-block] engine with a 4-inch stroke crankshaft, 6.135-inch [center-to-center] H-beam stroker rods, a 0.030-inch overbore, and a 10.5:1 compression ratio. [The top-end] will have Edelbrock large-port heads and a Z-11 intake with a three-deuce fuel-injection, probably Holley.

It will be going in a 1964 Impala SS convertible with a T56 six-speed, 3.90s, and a 26- to 28-inch tire diameter. This is a weekend car that we take on 200- to 300-mile trips. I'm thinking I'll be cruising at 2,000 to 2,300 rpm at 75 mph in sixth gear.

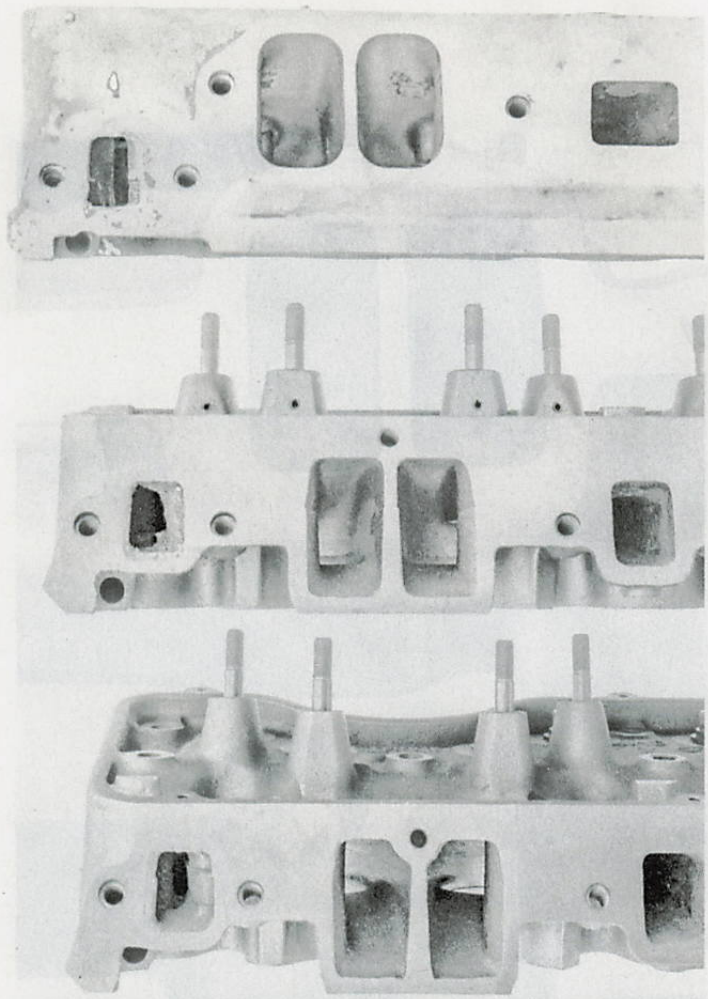
For the cam, I want a roller that has a nice lope at idle and strong midrange power.

A: A 409 is mighty fine, but a stroker 348 can still be great. Bryan, we'd be happy to recommend a hydraulic roller camshaft for the early 348 Chevy engine going into your 1964 Impala SS. The Mark 1 or W-series 348-409-427 Z-11 family shares some attributes with both the small-block Chevy and the modern big-block Chevy Rat motor. Think of this short-lived 1958–1965 production engine family as Chevy's "Neanderthal Man" that was a necessary evolutionary step toward the big-block we're all familiar with.

You can easily spot a member of this unusual engine family by its distinctive W-shaped, scalloped valve covers, and (with heads removed) the non-perpendicular engine deck (but don't confuse it with the late-model 6.2L diesel, which has somewhat similar appearing valve covers). Unfortunately, Bryan, you have some misconceptions as to what fits what, which calls for reevaluating some parts of your projected combo as we'll be detailing here.

ASK MARLAN A TECH QUESTION: PITSTOP@HotRod.com

Please provide a daytime phone number so we can contact you for more information if necessary. Questions will be answered in the print edition or on HotRod.com.



348/409 intake runner differences, *from top*: rare Z-11; high-perf, large-port 409; and 348/low-perf 409. The three different configurations have different size ports and intake manifold bolt patterns. As obvious from the photo, Z-11 ports are considerably raised.

Sources

ACDelco; Detroit, MI; 800.ACDelco; acdelco.com

Bill Mitchell Hard Core Racing Products; Edgewater, FL; 877.630.6651 or 386.957.3009; billmitchellproducts.com

Comp Cams; Memphis, TN; 800.999.0853 or 901.795.2400; compcams.com

Edelbrock LLC; Torrance, CA; 800.416.8628 (tech) or 888.799.1135 (e-commerce sales and customer service); edelbrock.com

Fuel Air Spark Technology (FAST); Memphis, TN; 877.334.8355 or 901.260.3278; fuelairspark.com

Holley EFI—Quick Time (Holley Performance Brands); Bowling Green, KY; 800.HOLLEY1 (nearest dealer), 866.464.6553 (tech), or 270.782.2900 (general); holley.com

John Elway Chevrolet on South Broadway; Englewood, CO; 866.273.4757 or 303.761.5161; johnelwaychevrolet.com/Order-Parts-Online

LWA Engines (Lamar Walden Automotive); Doraville, GA; 770.449.0315; lwaengines.com

Offenhauser Sales Corp.; Los Angeles, CA; 323.225.1307; offenhauser.com

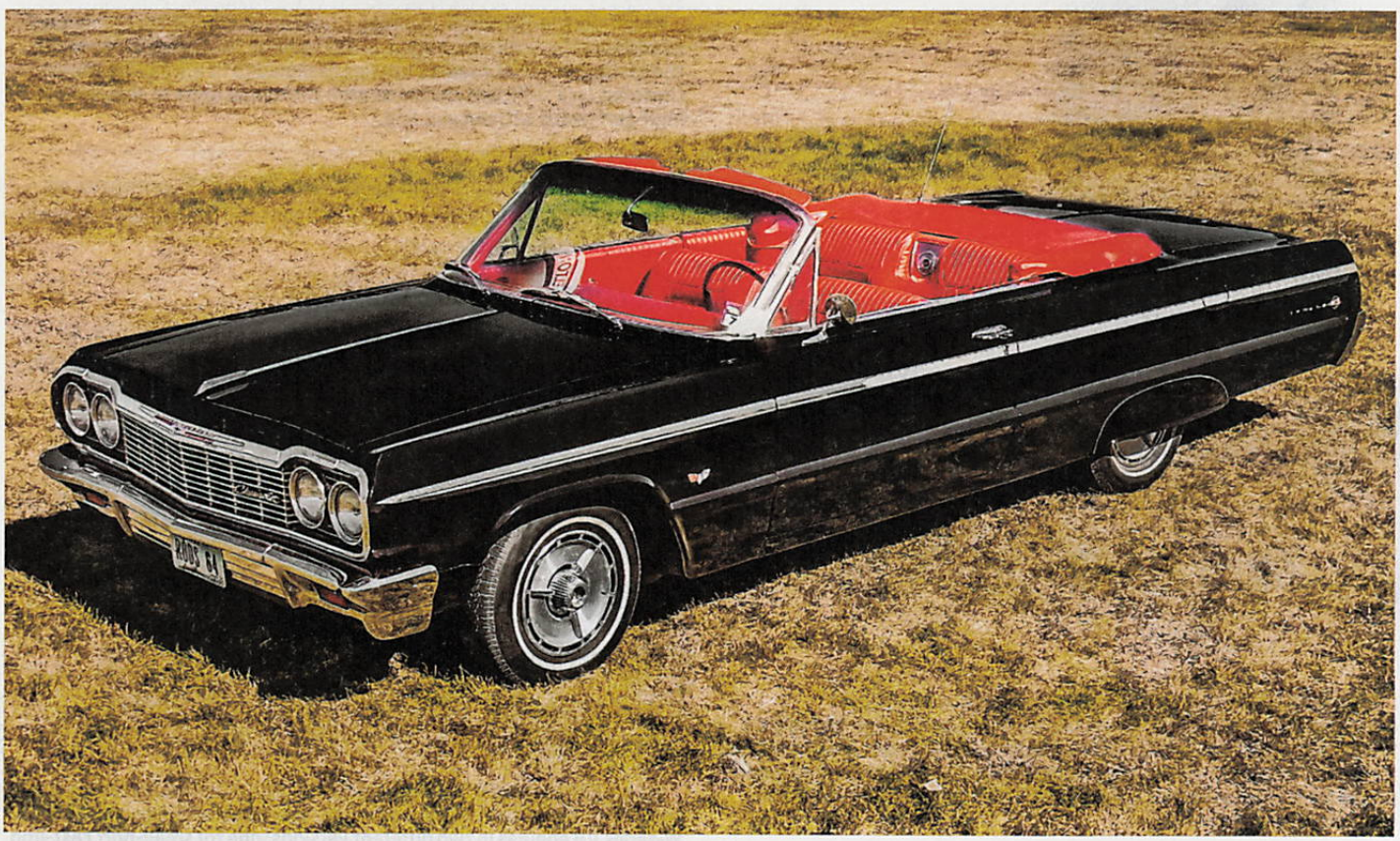
Scat Enterprises Inc.; Redondo Beach, CA; 310.370.5501; scatcrankshafts.com

Tremec; Novi, MI; 800.401.9866 (customer service) or 248.859.6500 (general); tremec.com

348-409 Chevy Engine Cylinder Head Differences

First, you need to understand 348-409 cylinder-head differences. There are three different styles of 348 and 409 heads, each with its own intake port configuration.

- All standard 348 heads, all high-perf 348 heads, and No. 586 1961 small-port 409 heads have rectangular intake ports, but the top adjacent roof corners of each pair of ports are cut at an angle to clear a between-port intake manifold mounting bolt.
- Nearly all documented 1962 and later factory 409 heads (including preferred high-performance stock casting Nos. 583 or 690) have larger rectangular ports, and the taller paired-port roofs are not cut off at their adjacent top corners to clear an "in-between" intake manifold bolt. Instead, the intake bolt-hole is raised for clearance. Edelbrock aluminum heads conform to the high-perf 409 head intake-runner profile.



Bryan Resh

Resh's 348 Chevy engine-based, 4-inch stroker motor will be dropping into his 1964 Impala SS convertible. Combined with a T56 six-speed manual trans and 3.90 rear gears, it should make for a great weekend highway cruiser.

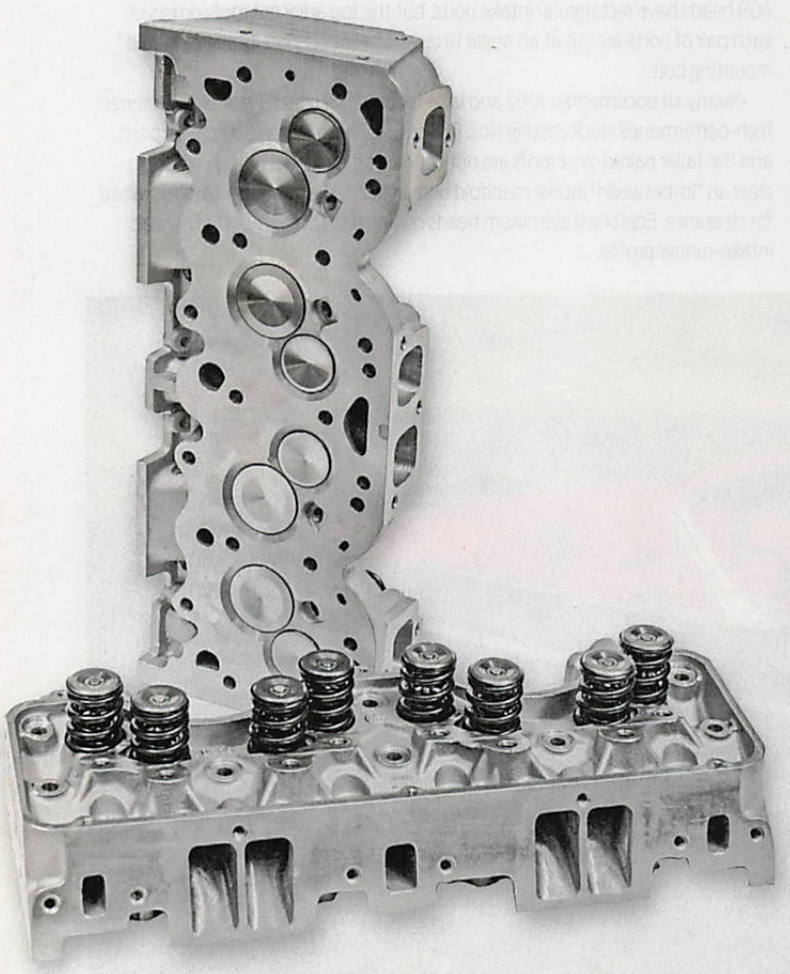
▪Z-11 heads (casting No. 731) were used only on limited production 1963 427 Z-11 engines and are unique unto themselves. Pretty revolutionary for 1963, the intake ports are raised considerably and have a nearly contemporary straight-shot valve-bowl approach. Even in original stock form they're said to flow about 300 cfm. Original GM iron Z-11 heads are nearly impossible to find today. Back at the turn of the century, a pair of them were already going for $10,000/pair. Lamar Walden offers its own new and improved Z-11 aluminum heads as well as a 2x4 Z-11 mini-tunnel-ram intake.

348-409 Chevy Engine Intake Manifold Interchange

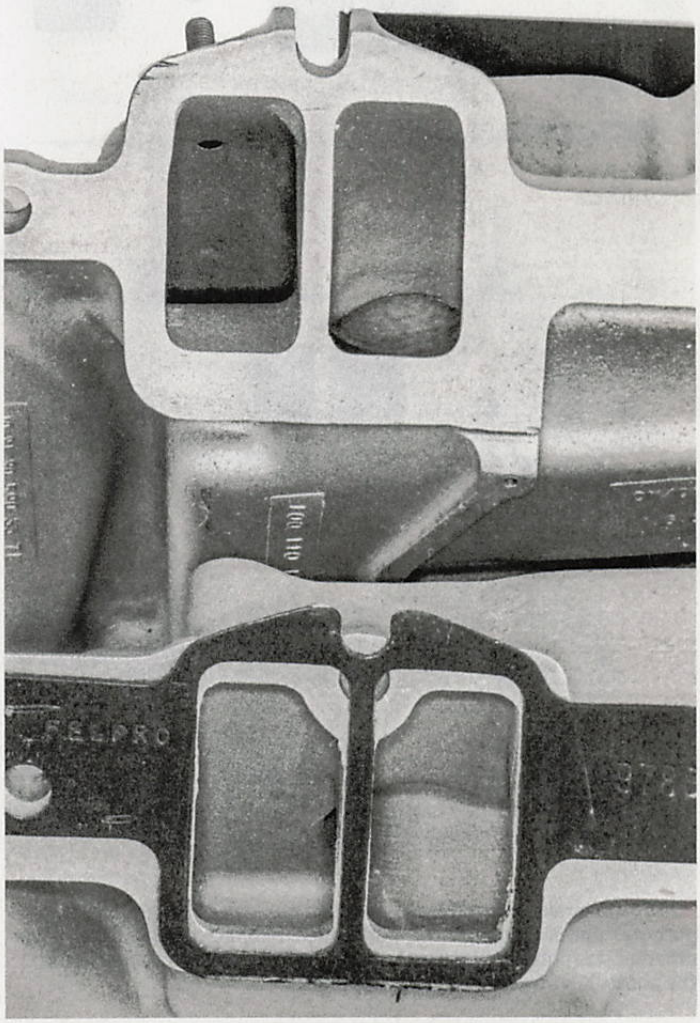
Second, there's the issue of intake manifold interchange between the three different head styles. Interchange is problematic: Either they don't interchange at all or degrade performance if you can sort of make them fit.

▪Intake manifolds for 348 and low-performance 409 heads won't fit and seal against high-performance, large-port, 409 heads unless you weld material to the intake runner roofs.

▪Intake manifolds for high-performance, large-port 409 heads will fit and seal against 348 or low-performance 409 heads if modded: Discard the two between-runner top bolts on each side and remove the extra bolt ears. The performance problem is that the high-perf intake-manifold runner is larger than the low-perf port entrance in the heads. The resulting mismatch causes reversion and poor performance. Port matching won't help because the production intake manifold runner-to-cylinder head entry forms a restrictive V-shaped intersection and the port-matching process only sharpens that angle.



Edelbrock 348/409 heads have the stock high-perf 409 port locations and valve angles, but use an improved port design for higher flow. Stainless 2.19/1.72-inch valves, hardened spring cups, screw-in studs for 7/16-inch-stud big-block Chevy rockers, thick 9/16-inch decks, and guide plates for 3/8-inch pushrods are standard. Joe Sherman fully ported the examples shown here.

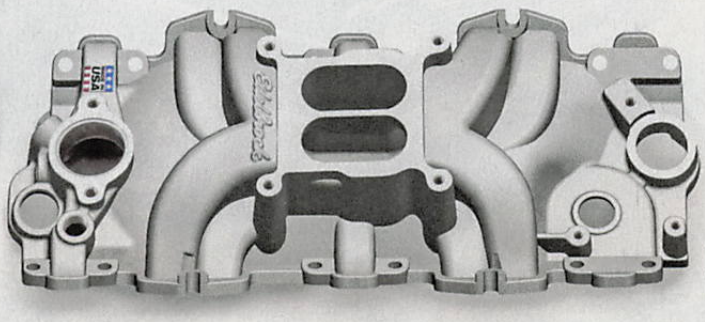


A high-perf, large-port 409 intake (*top*) can be modded to fit low-perf heads—don't use the two between-runner bolts, and carefully grind off the casting "ears" as needed. Intakes designed to fit a small-port head (*bottom*) lack sufficient thickness atop the runner roofs to seal against high-perf heads without welding.

▪Intake manifolds for the raised-runner Z-11 heads won't fit anything except Z-11 heads. Because of the considerably raised ports, Z-11 intakes are a two-piece design with a separate valley cover.

348-409 Chevy Engine Multicarb Intake Manifold Availability

Third, these 348-409 Chevy intake manifold differences affect your projected "three-deuce" TBI system configuration choices. Namely, it won't work.



Edelbrock

With a 1,500- to 6,500-rpm operating range, Edelbrock Performer RPM single four-barrel dual-plane intakes are available for Chevy 348-409 W-series V8 engines in two different versions: one for small-port cast-iron heads (PN 7158); the other (PN 7159, *shown*) fits factory 409 large-port or Edelbrock Performer RPM aluminum heads.

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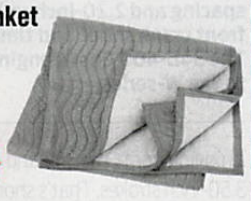

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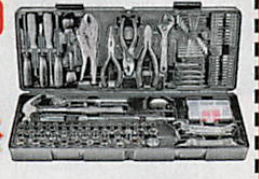

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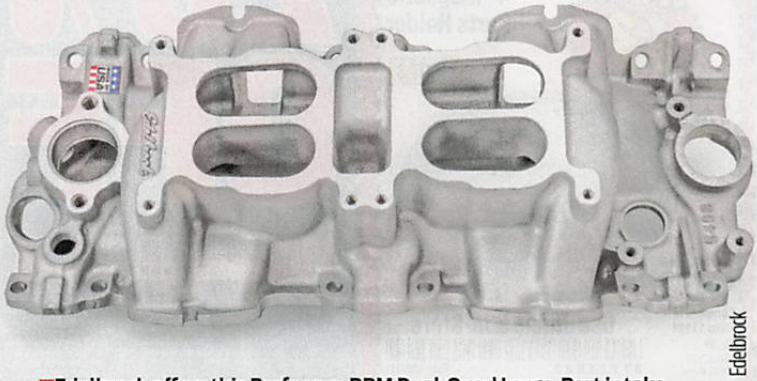
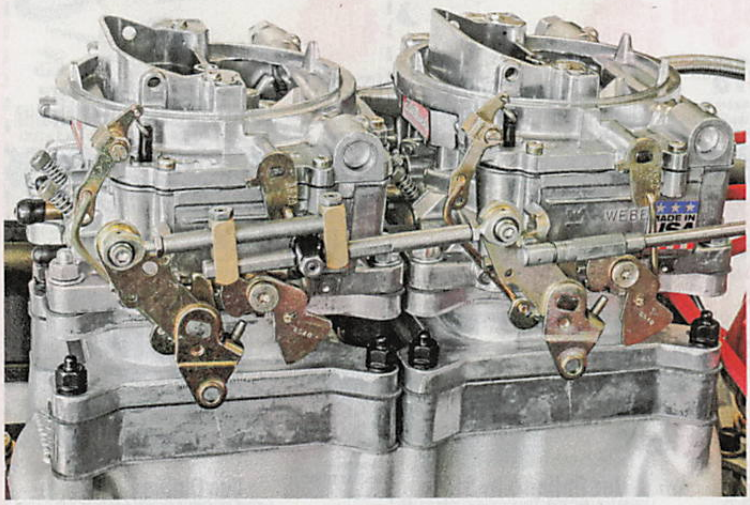


Edelbrock

Edelbrock offers this Performer RPM Dual-Quad Large-Port intake (PN 5409) that fits hi-perf OE 409 heads or Edelbrock aluminum heads. It mounts dual Carter AFB or AVS carbs or Edelbrock's equivalent.

- Single four-barrel intakes were offered for all three intake port configurations.
- "Three-deuce" (3x2-bbl.) intake manifolds—whether stock or aftermarket—were only available for 348 and low-performance 1961 409 small intake ports. There are no 3x2-bbl. intakes for high-performance, large-port 409 heads or Z-11 heads.
- "Dual-quad" (2x4-bbl.) intake manifolds—whether stock or aftermarket—fit high-performance-type 409 intake ports (including Edelbrock). Exception: Offenhauser offers dual four-barrel intakes for low-performance small-port heads; some variations even mount dual Quadrajets!
- Z-11 2x4-bbl. intakes exist but of course they fit only Z-11 heads. Contact LWA.

As far as I know, the dual-quad 409 high-perf intakes are all set up for Carter AFB carbs (or their Edelbrock descendants). Dual Holley four-barrels *might* fit if you can find old Offenhauser offset adapters. Unless you want to invest in a custom, made-to-order sheetmetal intake manifold, there's no way to run three two-barrel carbs (or TBI analogues) with factory high-perf 409 or Edelbrock cylinder-heads. FAST and Holley both offer dual four-barrel TBI systems. The throttle-bodies have a Holley carb standard-flange bolt-pattern, so there's a good chance you'll run into fore-and-aft clearance issues as mentioned above. Another solution



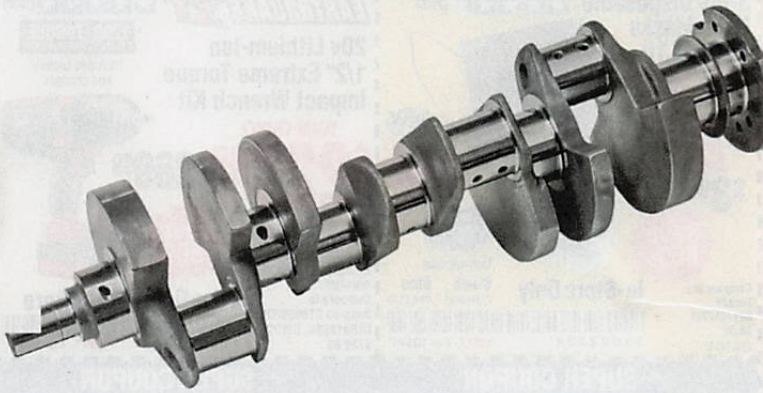
Edelbrock's dual-quad Performer RPM has a tight, 6 7/16-inch center-to-center carb measurement, just enough to clear inline-mounted Carter or Edelbrock AFB and AVS carburetors (not Holleys). On this high-end Joe Sherman build, Edelbrock carbs sit on 3-inch spacers and are actuated by Edelbrock's in-line linkage kit (PN 7094).

to the clearance issue for both Holley carbs and Holley-pattern TBI throttle-bodies is to try mounting them sideways (have fun with the throttle linkage, hah!).

Of course, if you're bucks up, you could have a custom sheetmetal intake made for three deuces on big-port heads—but if you are willing to go that far, you might as well go full port fuel-injection. Just sayin!

4-inch Stroker Crank in 348 Chevy Engine

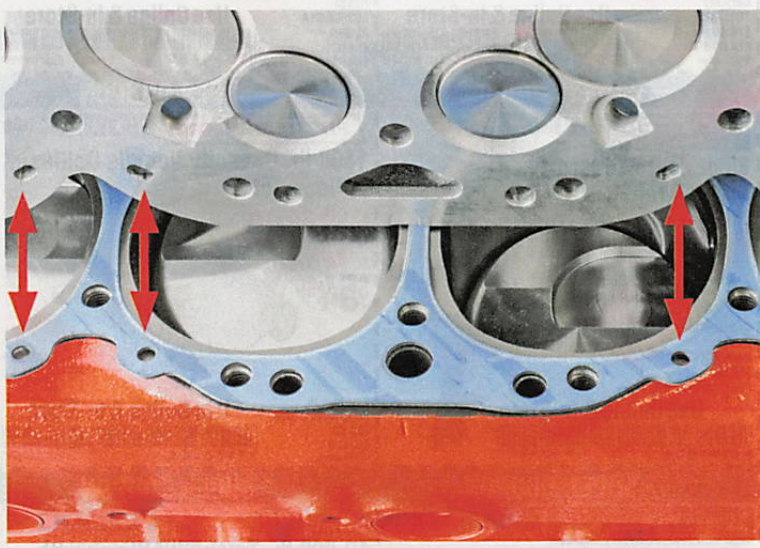
Installing a 4-inch-stroke crank in a 348-409 Chevy engine is a great move.



Scat sells a neutral-balanced, 4-inch-stroke, forged 4340-steel crank for 348-409 Chevy engines. The W-series engines have the same bore spacing and 2.20-inch rod journals as a modern big-block Chevy, but the front crank snout and timing cover seal are the same as a small-block. The 348-409 Chevy engine's 2.5-inch main bearing diameter is unique to the W-series.

In original form, the 348 and 409 engines had, respectively, only 3.25-inch and 3.50-inch strokes. That's short for a big-block engine, so they may not produce the big low-end torque numbers one normally expects out of a big-block. By way of comparison, the modern big-block 396 and 427 have 3.76-inch strokes and the 454 has a 4-inch stroke.

Back in the day, hot rodders would modify the later big-block Chevy Rat motor, externally-balanced, 4-inch-stroke, 454 crank to fit in a 348 or 409 by turning down the 2.75-inch big-block main journals to the 348/409's 2.5-inch size, reworking the snout to the 409/small-block balancer dimension, and contour-grinding the counterweights down slightly to clear the oil pan rail area. Clearance-grinding was also often needed at the bottom of the cylinder bores. Rods with 3/8-inch rod bolts had to be used in the 396/427 big-block Chevy because the later high-perf and heavy-duty 7/16-inch-bolt factory rods wouldn't clear the block. At least the big-block Chevy versions were stronger than the original 348-409 rods! Stock big-block Chevy and W-series 348-409



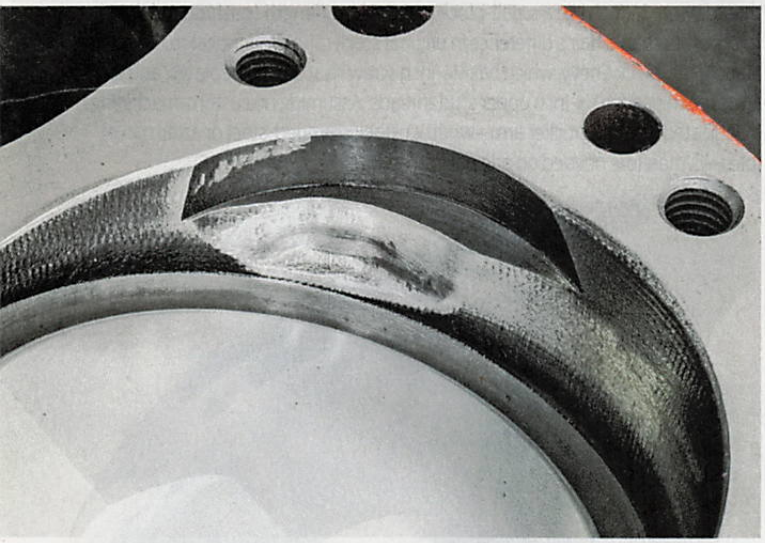
Most 348-409 blocks and heads (including Edelbrock's) have spark plug cooling slots (*arrows*). To prevent a massive coolant leak, plug the slots when installing later-style heads or Edelbrock heads on a 1958 348 block, which lacks the extra holes or even full casting material in that area.

rods both measure 6.135-inch center-to-center (in blueprint condition).

Today, 4-inch-stroker kits are widely available from aftermarket sources as a complete drop-in (no grinding), internally-balanced, rotating assembly with a forged crank, 7/16 contoured rods, pistons, rings, and bearings. Scat even lists a 4-inch stroker kit including pistons specifically for the 348 Chevy engine.

348 Chevy Engine Exhaust Valve-to-Bore Clearance

One potential problem with your short-block is exhaust valve-to-cylinder wall interference with any sort of modern, aggressive, high-lift cam profile in the small-bore 348 Chevy engine. Officially, Edelbrock says not to exceed 0.550-inch valve lift on a 348—but that's kind of a "CYA" statement. If you're willing to significantly (but carefully) notch the bore, much higher lifts are possible. I once worked with the late, great engine-builder Joe Sherman on building up a "21st century," 650-hp version of the old W-series big-block with the then relatively new Edelbrock cylinder heads (see the Nov. '09 HOT ROD print edition, or go to "Chevy W-Series Engine Build-The Reanimator from 348 to 437" on hotrod.com for the web version).



Due to the non-perpendicular deck surface, 348-409 exhaust valves open at a weird angle toward the cylinder wall. To keep the Edelbrock head's 1.72-inch exhaust valves from hitting a 348's cylinder walls with a big cam, carefully grind additional clearance beyond that offered by any factory-machined scallop. Careful! Don't uncover the top ringland at TDC.

With 409 blocks hard to find even 11 years ago, Sherman's buildup was a no-holds-barred 348-inch-based stroker mill with a radical mechanical roller cam that spec'd out at 265/270-degrees duration at 0.050 and 0.737/0.737-inch lift with T&D shaft-mounted 1.7:1 rockers. The photo (*left*) shows the giant valve notch needed to clear that big a cam on a small-bore 348. You must know what you're doing to get the necessary clearance without impinging into the piston's first ring-groove or perhaps even hitting water on a 348 Chevy engine.

A max-safe overbore is one way to also help gain more valve-lift clearance. Nearly all 348 Chevy engines can go 0.060-over the stock 4.125-inch bore, which with a 4-inch stroke crank yields a 440ci engine (as opposed to a 434 with a projected 0.030-over bore). Unfortunately, a 0.060-over 348's final 4.185-inch bore-size still ends up 0.1275-inch smaller than even a stock 409's 4.3125-inch-diameter cylinders. (And if you're wondering about boring a 348 out to 409, the answer is: Nearly always never—it would amount to a $^{3}/_{16}$-inch (0.1875) overbore! In fact, you can't even go $^{1}/_{8}$-inch (0.125) over on a 348 without excessively thinning out the cylinder walls.)

As with any healthy cam install, mock everything up and check piston-to-valve clearance, upper valvetrain clearances, and pushrod length necessary to establish correct valvetrain geometry. Stock-length pushrods almost certainly will not be correct with taller roller lifters.

348 Chevy Camshaft

Keeping all this in mind, let's see if there's a "catalog" 348 Chevy camshaft that meets your needs. Remember that a 1964 Impala SS convertible is a full-size car that officially weighs about 3,800 pounds in baseline trim, and likely considerably more, depending on options; you want a "roller cam with a healthy lope;" and

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finally there is the potential for throttle-body injection (TBI). Comp Cam's Billy Godbold reports the catalog's smallest listed Thumpr hydraulic roller grind (PN 48-600-10) would be just what the doctor ordered in this situation. Similar returns from readers and customers really like this cam. It sounds bad, yet still returns good low and midrange performance in a heavy car.

The recommended Thumpr 348 Chevy camshaft for your 348 Chevy engine is ground on a cam billet with a 4/7 firing order swap. In other words, instead of a standard Chevrolet 1-8-4-3-6-5-7-2 firing order, the cam's firing order is 1-8-7-3-6-5-4-2. In a competition engine, proponents of this swap claim slightly better engine durability plus a little more power at extreme high rpm. At your level, it really doesn't make a difference. "The power is probably within 1 percent, assuming you have the plug wires ordered correctly," remarks Godbold.

Another factor is whether a 4/7 firing order swap is compatible with "normal" dual-plane (divided-plenum) intakes where each side of the divided plenum feeds half the cylinders, so arranged where each firing pulse in the firing order is separated by 180 degrees of crankshaft rotation due to the divided plenum. The answer, says Edelbrock, is that the swapped cylinders are still fed by the same plenum half, so the fuel distribution won't be adversely affected. Street car exhaust headers connected to a full exhaust system should not be adversely affected, though it "might" make a difference on the primary tube merge order into the collector on a highly-tuned Pro-level car with max-effort engines and open exhaust.

But why would a mainstream streetable catalog cam be special-ground for the 4/7 swap in the first place? I'll hazard a guess that a 4/7 swap Thumpr cam grind was made necessary because of cam core availability at the time the current catalog was printed back in 2016. However, I'm told a "standard" firing-order billet cam is now also available on a custom-order basis (basic generic 348-409 custom hydraulic roller cam PN 48-000-14). Even though it's a special-order, the Comp Cams direct price is lower: $458.21 for the standard firing-order version vs. $582.19 for the 4/7 order (official Comp pricing; you may do better from one of the large online outlets). Comp's Robert Overfield says the nearly $125 price change "comes from the difference in core material. The 4/7 swap PN 48-600-10 uses an 8660-steel core and the 48-000-14 custom cam ground for the standard firing order uses an 8620 core." Both cams come with a pressed-on cast-iron distributor gear that's compatible with the standard factory-type distributor driven-gear. To order the custom (standard firing-order) version, call into the tech line, and, Overfield says, "Tell the Tech you'd like to order the 48-600-10 4/7 swap profile on a standard firing-order core, and the tech will take it from there."

CAMSHAFT SPECS

Part Nos.	48-600-10 (4/7 firing-order swap) 48-000-14 (custom: 48-600-10 with standard firing-order; see text for details)
Type	Hydraulic roller-tappet
Series	Thumpr
Grind No.	C409 47S283THR8
Listed operating range	2,000 to 5,800 rpm (in a 409)
Advertised Duration	280 int./303 exh.
Duration at 0.050	227 int./241 exh.
Valve Lift (1.75:1 rockers)	0.5635 int./0.546 exh.
Lobe Separation Angle (LSA)	108
Installed Lobe Centerlines	103 int./113 exh. (5 degrees advanced)
Valve timing @ 0.006 lift	Intake opens/closes: 37 BTDC / 66 ABDC Exhaust opens/closes: 79 BBDC / 44 ATDC

348 Chevy Engine Upper Valvetrain

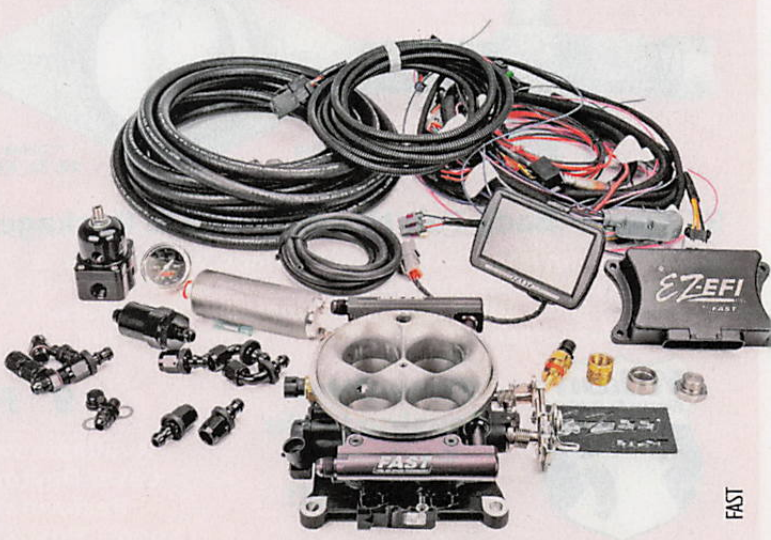
Edelbrock is now part of the Comp Cams family. Comp says the "package" valvesprings on Edelbrock cylinder-head assembly PN 60815 are designed for use with hydraulic roller cams and should do the job. Unlike most old GM 348-409 heads, Edelbrock heads have plenty of clearance and material for a decent valvespring package.

Original 348-409 heads used press-in rocker arm studs (on high-performance 409s the studs were also pinned). The top half of the stock stud's rocker arm threads were $^{3}/_{8}$ inch like a small-block, but the body length (pushrod to fulcrum to tip, other than a hair's difference in original stock ratio) is identical to the later Mark IV big-block Chevy, which has $^{7}/_{16}$-inch screw-in studs, guideplates, and rocker arms machined for $^{7}/_{16}$-inch upper stud threads. Assuming no custom-machining, a dedicated 348/409 rocker arm—whether stock stamped-steel or aftermarket roller—is therefore needed on original iron heads.

Comp Cams

Forget about using stamped-steel big-block Chevy "replacement" type rockers on Edelbrock 409 heads and roller cams. Due to the increase in lift over stock as well as much stiffer valvesprings, with a hydraulic roller cam you need to use full roller rocker arms, such as Comp's Ultra Pro Magnum big-block Chevy roller rocker arm set, PN 1620-16.

This all changes with Edelbrock 348-409 cylinder heads, which come with screw-in studs and guideplates. On them, the threads that screw into the heads and the rocker arm attaching threads are $^{7}/_{16}$—just like the big-block Chevy. Therefore, the correct rocker arms for Edelbrock 348-409 heads are in fact 396/427/454 big-block Chevy rockers.



FAST

If you want to run a multi-TBI system on big-port 409 heads, it will have to be dual-quad TBIs from FAST or Holley. Adapter plates and sideways mounting will likely be needed. Shown is a complete FAST TBI system with inline fuel filter (PN 30227-06KIT). Order PN 304155-06 add-on kit to get the second four-barrel throttle-body and harness.

Fuel-Injection Compatibility

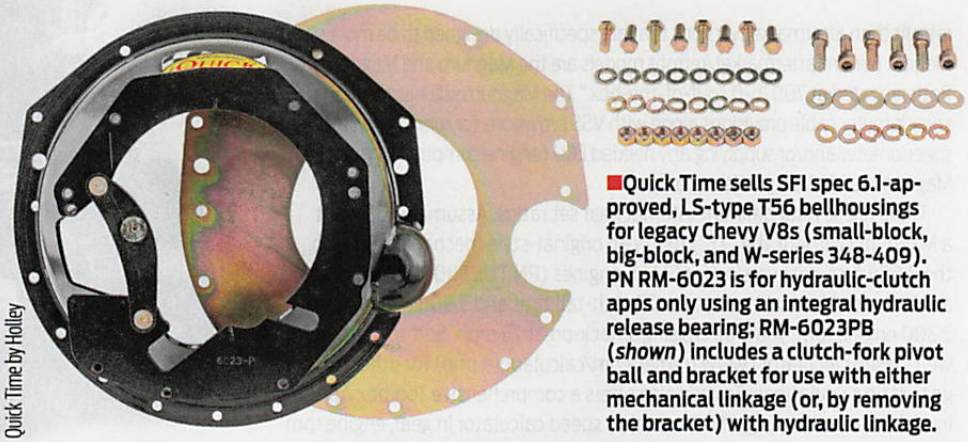
The recommended Thumpr cam for your 348/409 is ground on 108-degree LSA (lobe separation angle), with the intake centerline 5 degrees advanced. That's OK with traditional carburetion—and these specs are what gives the cam that healthy lope—but traditionally it's seen as a little flaky for fuel injection because of lower than normal idle vacuum (may confuse MAP sensor), as well as greater overlap for a given 0.050-inch duration value (may dilute exhaust gas with unburned fuel at low rpm, confusing the O2 sensor). Traditional thinking is that with fuel injection, you want to see at least a 110-degree or wider LSA. Comp officially says that with its sister company FAST's self-tuning EZ-EFI system—which includes a special pre-programmed fuel table in theory matched to the Thumpr's unique characteristics—this cam should still work because the aftermarket system's MAP sensor, ECU (computer), and wideband O2 is designed for compatibility with performance modifications, as opposed to less latitude built into OE-based computer setups. Still—and this is my two-cents' worth—when you move to a niche engine with a healthy narrow-LSA cam, you must be prepared for at least some manual programming intervention, particularly on cold-start, idle control, and/or off-idle throttle tip-in response. Vacuum-assisted power brakes may require at a minimum a vacuum-reserve canister, or at maximum an auxiliary electric vacuum pump.

Building a Niche 348-409 Chevy Engine Requires Special Expertise

All this is not to discourage you, just things you're going to have to deal with. Frankly, I'm most concerned with valve-to-cylinder wall clearance as well as piston and ring installation in the 348 Chevy engine's non-perpendicular block deck. This is not just another paint-by-the-numbers small-block Chevy build. As Billy Godbold puts it: "As someone chooses to go 'back in time' with engines and components made more than half a century ago, the value of having a very experienced engine builder (not engine assembler) involved rises exponentially. Some things that are extremely simple for an experienced engine builder might be a recipe for first heart failure, and then disaster, for a less engine-focused hot rodder. The tools common to masters of that trade (including sonic checks and experience notching cylinder bores) have some value in any build, but when you can't just grab another engine at the junkyard for $500-$1,000 when something goes wrong, having someone who knows how to closely inspect every component, check clearances, check oil flow, and really go over each step like a detective will pay dividends for years to follow." One nationally recognized 409 engine expert and builder is Lamar Walden.

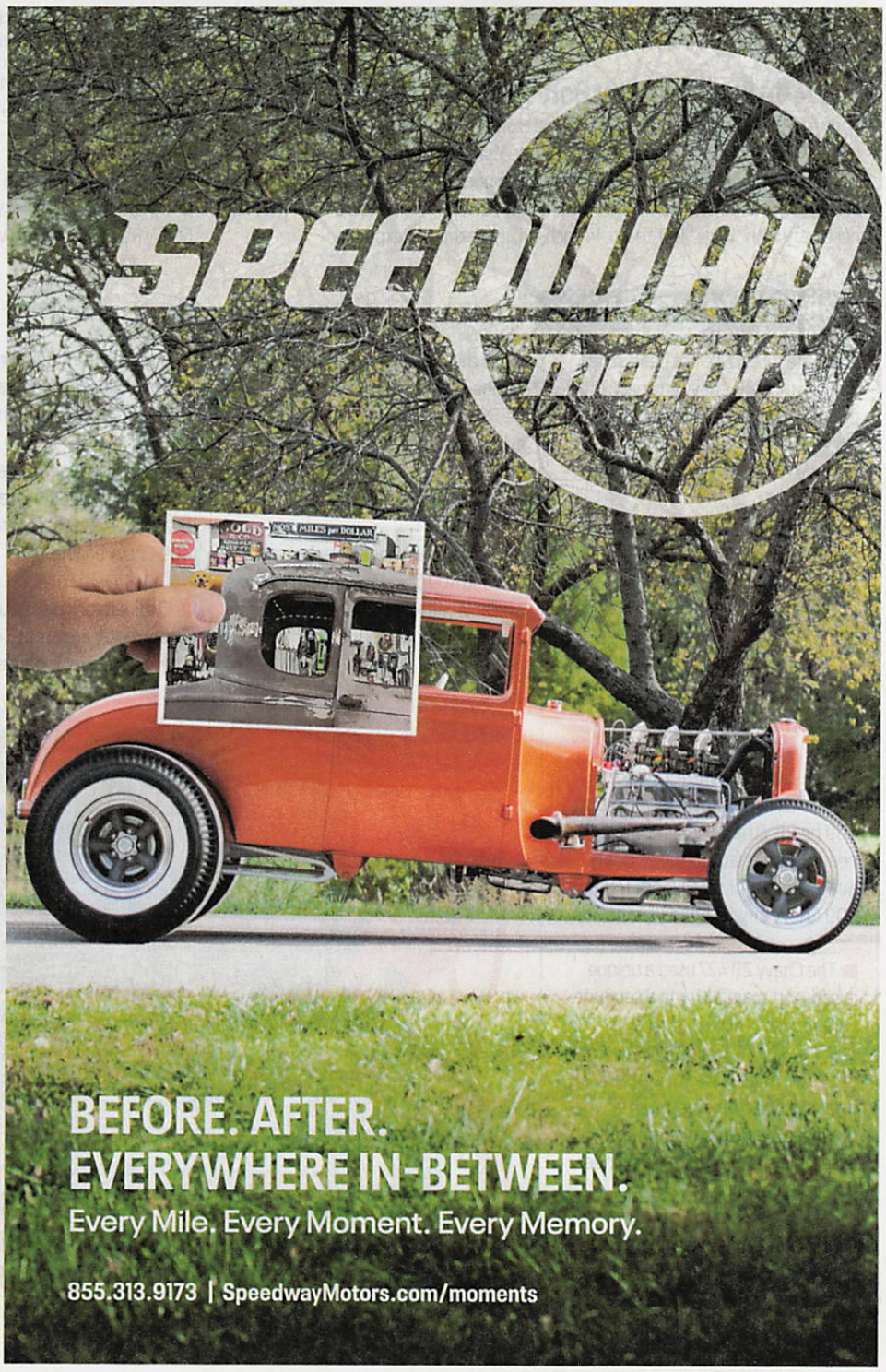
T56 Transmission Behind Chevy 348-409 Chevy Engine

There are several different aftermarket/retrofit versions of the T56 six-speed, as well as current TR-6060 OE versions used behind selected late-model Ford, Chrysler, and GM cars. A production-based TR-6060 is generally considered harder to



Quick Time by Holley

■Quick Time sells SFI spec 6.1-approved, LS-type T56 bellhousings for legacy Chevy V8s (small-block, big-block, and W-series 348-409). PN RM-6023 is for hydraulic-clutch apps only using an integral hydraulic release bearing; RM-6023PB (*shown*) includes a clutch-fork pivot ball and bracket for use with either mechanical linkage (or, by removing the bracket) with hydraulic linkage.

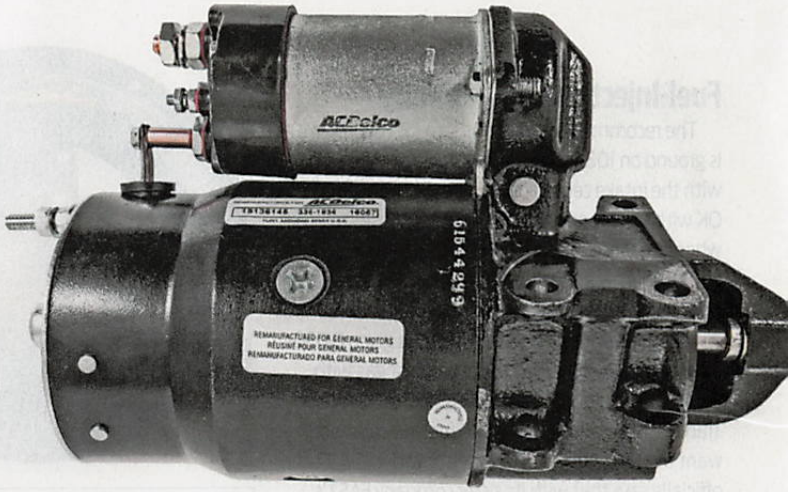


retrofit than aftermarket versions that are specifically designed to be more swap-friendly. Current aftermarket/retrofit models are the Magnum and Magnum XL. Both are rated at 700 lb-ft "out-of-the-box." The Magnum still has mechanical speedometer cable provisions along with VSS provisions for running an electric speedometer and/or supplying any needed ECU (engine computer) input; the Magnum XL has VSS provisions only.

There are several different internal gear set ratios. Assuming you want a Magnum (without the "XL") to run an original-style mechanical speedo, the 2.66:1 first-gear version for GM LS engines (PN TUET11009) comes with a 0.63:1 overdrive sixth gear; with 27-inch-tall tires and 3.90:1 rear gears, at 2,300 engine rpm, you'd be cruising smack-on at 75 mph. Surf to Tremec's web-based calculator (www.tremec.com/calculadora.php) for other rpm/tire/gear-ratio calculations. Tremec also offers a comprehensive Toolbox App that includes a driveline angle finder, vehicle speed calculator in gear, engine rpm calculator, and tire size calculator for both Apple and Android mobile phones. Quick Time has the LS1-pattern T56 bellhousing for bolting an LS-based T56 to legacy Chevy V8s like yours.

348/409 Engine Starter Bolt-Pattern Caution

The Quick Time T56 bellhousing has no starter mounting provisions on the bellhousing as was still the case on many late 1950s and early 1960s Chevy V8 stockers. Be aware there are three-bolt block-mount 348 and 409 Chevy engine starters with a nonstandard block-mount bolt pattern. This weirdo starter may be necessary with "large" 168-tooth, 14-inch-od, flywheels or flexplates.



ACDelco

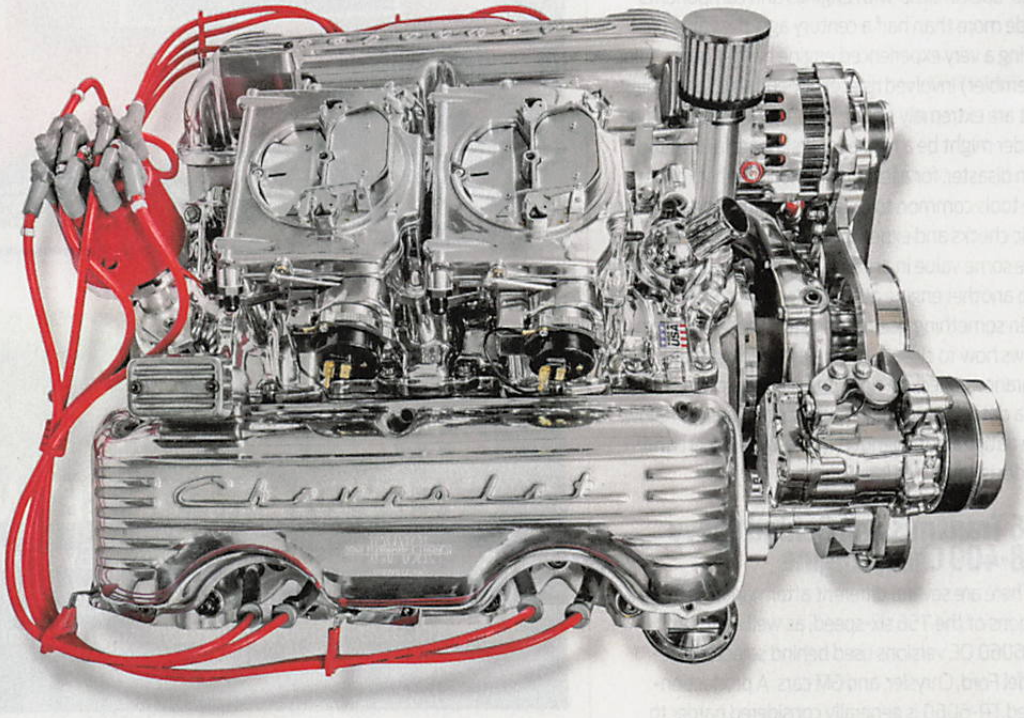
The three-bolt, block-mounted starter for 168-tooth flywheels/flexplates used on some 348 and 409 Chevy engines is still available remanufactured from ACDelco (PN 336-1836 or GM 19136145). The spacing between the two straight-across bolt holes is not the same as most later Chevy V8s.

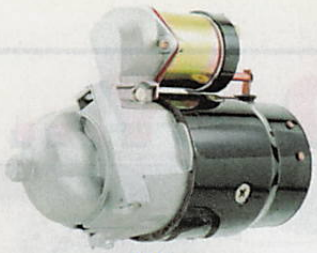
For more information on classic Chevrolet 10MT starter mounting bolt-patterns and starter-drive (nose) variations, see the Delco-Remy 10MT starter info at Ray's Chevy Restoration Site (www.rmcavoy.freeshell.org/starters.html).

348-409 Chevy Engine Tips

There are three different head styles for 348 and 409 Chevy engines: Small-port 348 and low-performance 409, large-port high-performance 409 (includes Edelbrock), and 427 Z-11.

- Intake manifolds don't directly interchange between the three different 348 and 409 engine cylinder-head styles.
- Three-deuce (3x2-bbl.) intake manifolds were made only for small-port 348 Chevy engine heads.
- Dual-quad (2x4-bbl.) intake manifolds came stock on large-port 409 heads (they also fit Edelbrock heads). Offenhauser makes dual-quad intakes for small-port 348 and 409 Chevy engine heads.
- The Chevy Z11 427 used a unique raised-port manifold with a separate valley cover.
- Scat is one source for drop-in 348 and 409 Chevy engine, internally balanced, 4-inch stroker rotating assemblies that require no cylinder-block clearancing.
- To avoid a massive coolant leak on a 1958 348 Chevy engine block be sure to plug the spark plug cooling slots when using later heads or Edelbrock heads.
- On the small-bore 348 Chevy engine, when installing over 0.550-inch-lift camshafts, check exhaust valve bore clearance at full cam lift and notch the bore for clearance as needed.
- Comp Cams is one source for both 348 and 409 Chevy hydraulic roller cams available with either the standard firing order or with a 4/7 firing order.
- Dual-plane intakes for 348 and 409 Chevy engines are compatible with a 4/7 firing-order swap camshaft.
- Edelbrock offers modern Performer RPM single and dual-quad high-rise dual-plane intakes for the 348 and 409 Chevy engine.
- On Edelbrock heads, use big-block Chevy rocker arms, not 348 or 409 Chevy engine rocker arms.
- Some manual tuning intervention may be needed with self-learning TBI systems and tight LSA camshafts.
- Quick Time offers bellhousings to bolt up LS-type T56 six-speed manual transmissions behind the 348 and 409 Chevy engine.
- Some 348 and 409 Chevy engines with a 168-tooth flywheel require a unique three-bolt, engine-mounted starter. ACDelco is one source.





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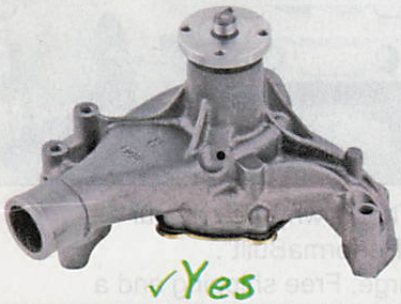

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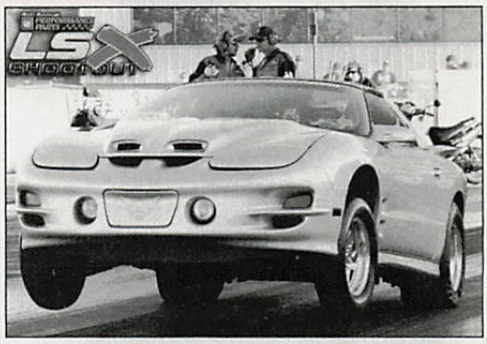

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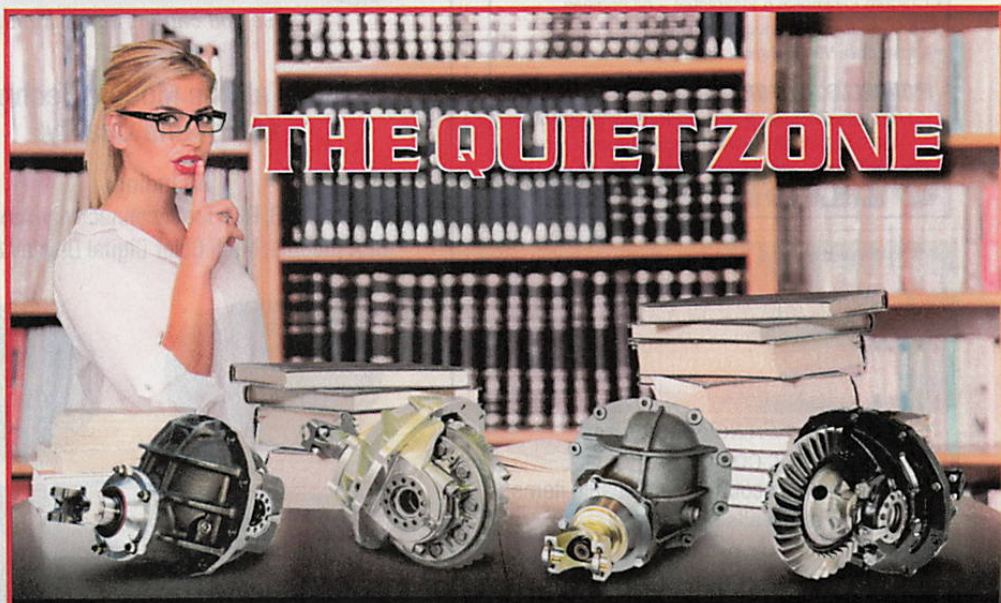

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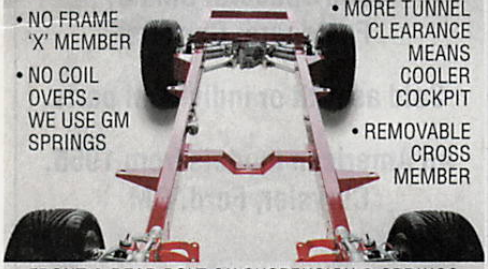

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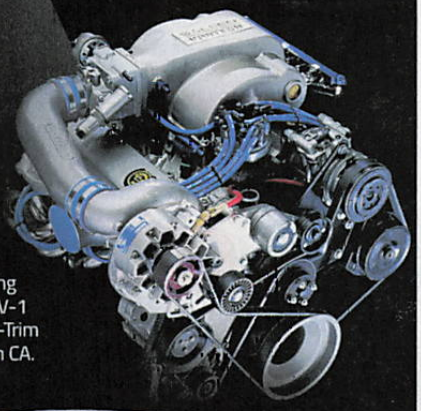

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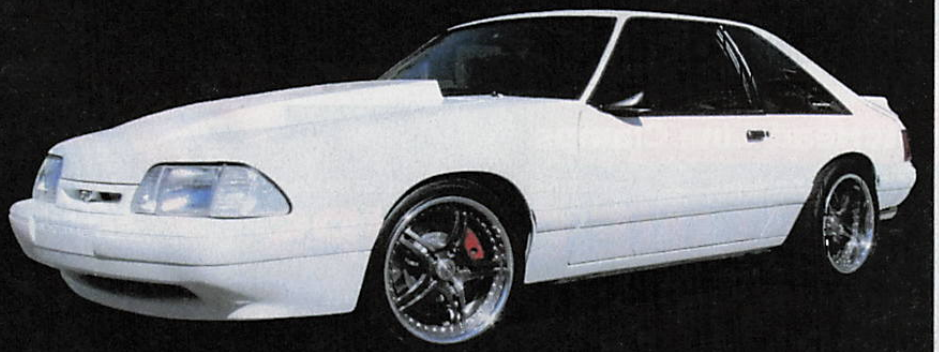

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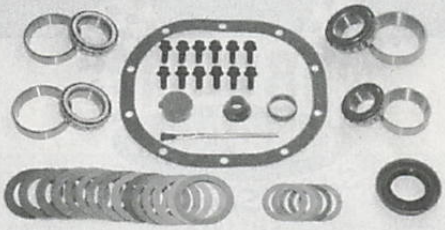

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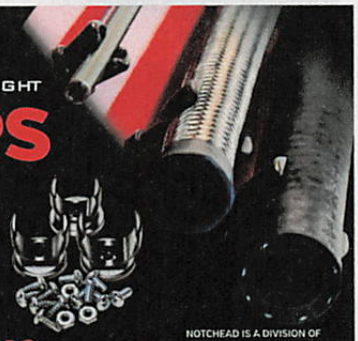

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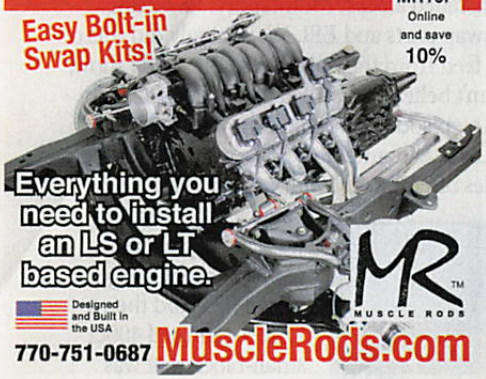

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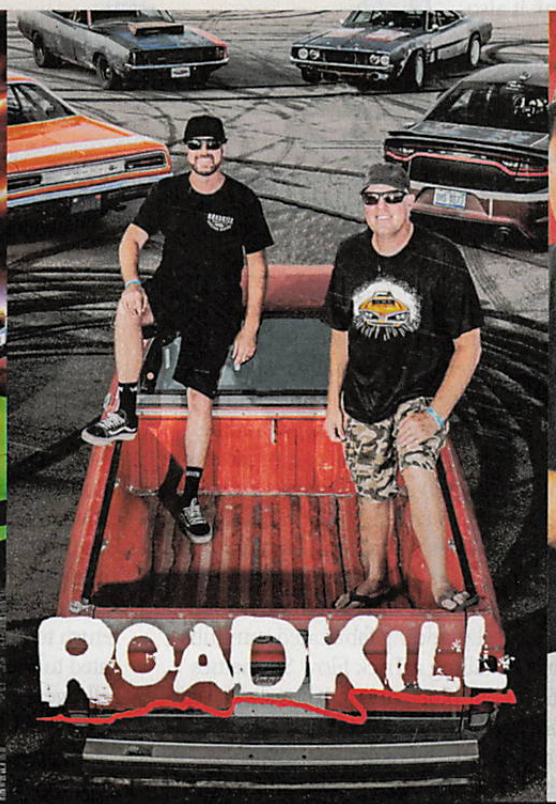

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25 Years of the Crusher Camaro

I'm gonna tell the story of the Crusher Camaro because it's celebrating 25 years as a project and because it's presented me with a fresh dilemma. The story begins in 1994 when California law allowed gasoline companies to crush older cars in exchange for smog credits that allowed continued polluting from wells and refineries. The bureaucratic presumption was that killing an old car would take it off the road and therefore stop it from polluting, thereby offsetting the smog from the refineries. The deal allowed private parties to sell older cars for $700. Enterprising gearheads found a way to flip a whole mess of old cars that hadn't been legitimately driven in a decade or more.

By David Freiburger

Roadkill
@davidfreiburger

I found this wildly bogus and proposed to Jeff Smith—then the HRM editor—that we go to a junkyard and buy an old car out from under the gasoline company's crusher program. Rob Kinnan and I went to the yard and found a number of potential projects, and then I saw a Scheib-tan '67 Camaro pulling in the driveway. I ran at full speed to the car and asked the driver if he was turning it in. He said yes, because his son wanted a mini-truck and his wife didn't want the Camaro in the driveway. The guy had owned it since the '70s with its inline six and Powerglide trans. I asked if I could give him the $700 so it wouldn't be crushed, he said yes, and the rest is history.

The car that instantly became known as the Crusher Camaro first appeared in HOT ROD 25 years ago, as we told the story of rolling the car away from the junkyard and over to a Chevron station where it passed an emission test up to the standards of a much newer car. I think it also got 21 mpg. This put the lie to the buyback program.

At this time I was transitioning away from the HOT ROD staff to become editor of *Petersen's 4-Wheel & Off-Road* magazine. Rob Kinnan took over the Crusher, and his first step was to install a 406ci small-block that was tested with the EPA to show that it was environmentally responsible. Rob destroyed himself cleaning up the undercarriage, he had a '68 houndstooth interior installed, and he chose the House of Kolor base yellow paint that was applied by Bernt Karlsson in a couple weeks and that appeared on the March '95 cover. The same paint is still on the car. The Crusher was a Long Hauler on the first Power Tour.

Later, when Ro McGonegal was the editor, he had the car changed radically, adding fabricated minitubs and a rollcage and installing a Trick Flow Specialties all-aluminum, 632ci big-block. Incongruously, the car was also re-stanced on 17-inch wheels and appeared on the May '03 cover with the main blurb "Suspension That Works," which it didn't. Ro left soon after and took the 632 with him.

The Crusher sat unloved until 2007 when I installed a 383 small-block that ran 12.0s at the drag strip. In 2009 I converted the car to a '70-style street machine with a blown big-block, complete with gold Moroso valve covers, and a tall stance on Center Lines and later Cragars. This was when we first started doing videos. Search YouTube for one called "Blown Big-Block '67 Camaro Road Trip." In fact, search "Crusher Camaro" and you'll find all sorts of stuff. Video is how a whole new legion of fans discovered the car.

In 2016, Mike Finnegan and I removed the big-block and installed a Mast Motorsports LS7 using Holley LS-swap parts and EFI. We daringly did this on a live video feed from the floor of the PRI trade show, and I still can't believe we pulled it off. That's also on YouTube. An episode of *Roadkill* showed the LS7 running 10.0s at Sacramento Raceway.

In episodes of *Hot Rod Unlimited* and *Hot Rod Garage*, the Crusher was later repowered with a MagnaCharger blown LS3, and then a tunnel-rammed 400ci small-block that was dyno tested at 550hp on the very first episode of *Engine Masters*. Steve Dulcich and I installed and tuned that setup on multiple episodes of *Roadkill Garage*, and it runs 10.70s on pump gas. All the aforementioned shows can be seen on the MotorTrend app.

The car's current look isn't for everyone, especially those who don't understand the context of the Grump Lump schnoz. I was shooting for the look of a 1974-ish NHRA Modified Production drag car. Nailed it, too.

Have you kept count? That's eight engines in the car so far. I've been flattered by many who have called the Crusher "the new Project X," referring to the '57 Chevy project car dating back to the early '60s in *Popular Hot Rodding* and then HOT ROD. Both cars have changed many times in many ways. And now I feel it's time for another changeover for the Crusher–a vehicle that I've called my favorite car—despite also owning the Super Bee that was my first car—because it's easy to work on, and fun, and an unlimited canvas.

The dilemma: what happens next? Video fans want a return to the blown big-block Chevy, though I'd be obligated to make it much faster, which entails adding a full rollcage. I once swung a 426 Hemi into the car, and I can make that fit if I convert it to rack-and-pinion steering. To further shake people up, I've considered installing a Ford Cleveland. More likely to happen is the all-aluminum small-block I've dreamt of, which would allow me to keep the retro look that I'm digging so much.

So there ya have it, a quick overview of a project car that's lasted 25 years, but that never gets old.

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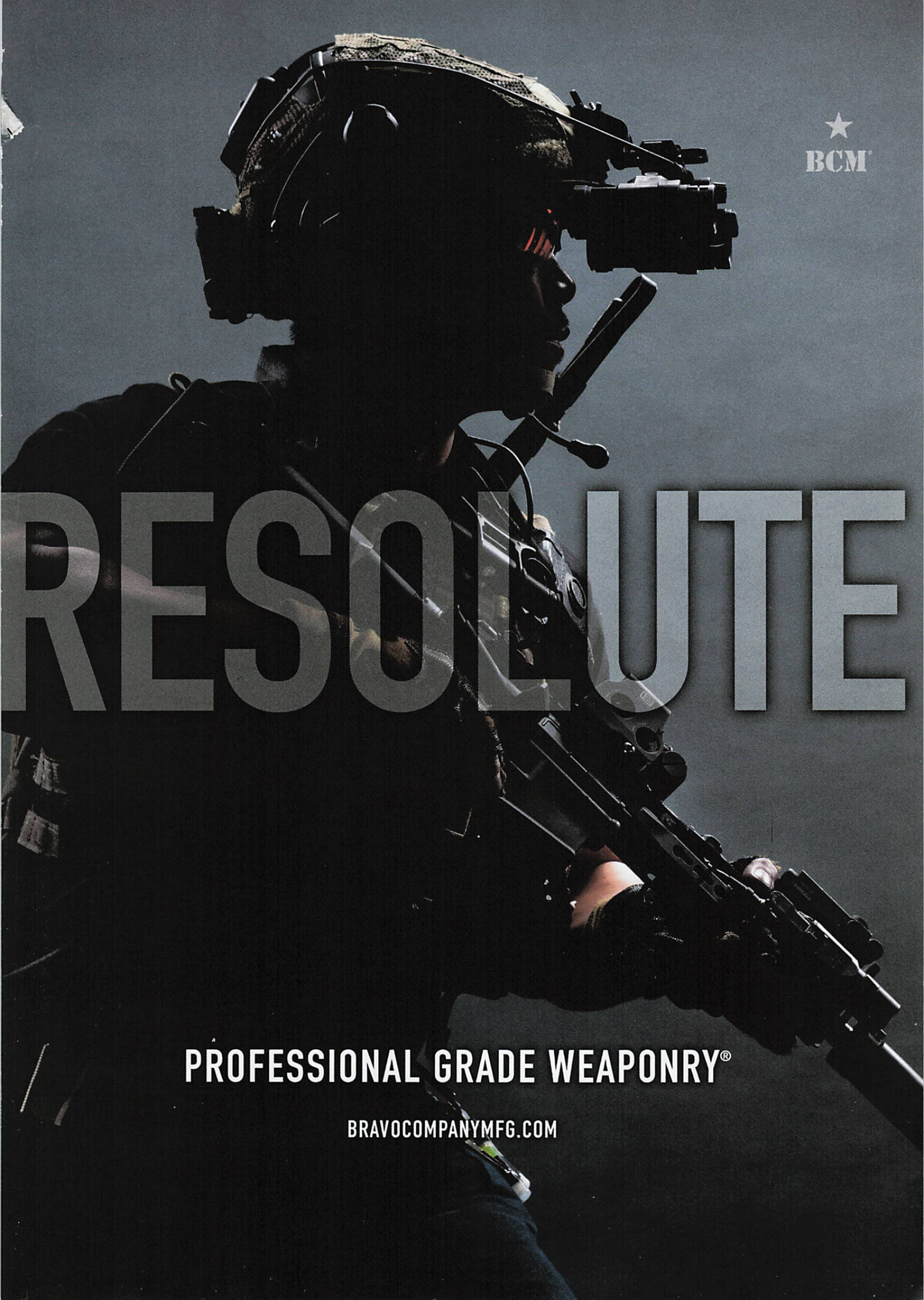
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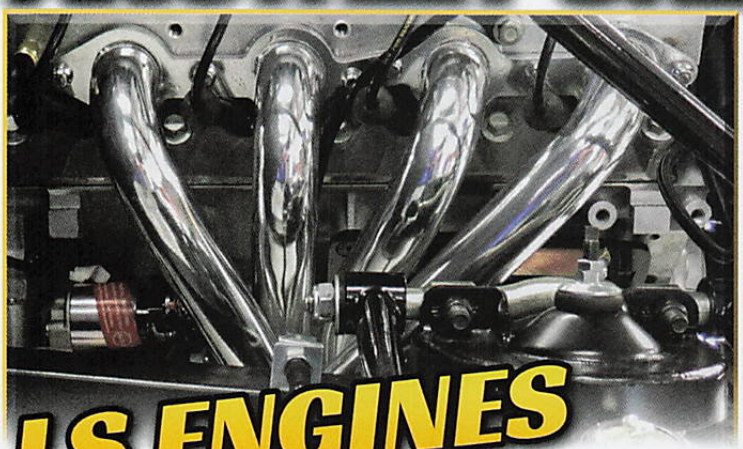
Steering • Brakes • Suspension

HOT ROD Duralast

SEE THE BUILD
SCAN QR CODE

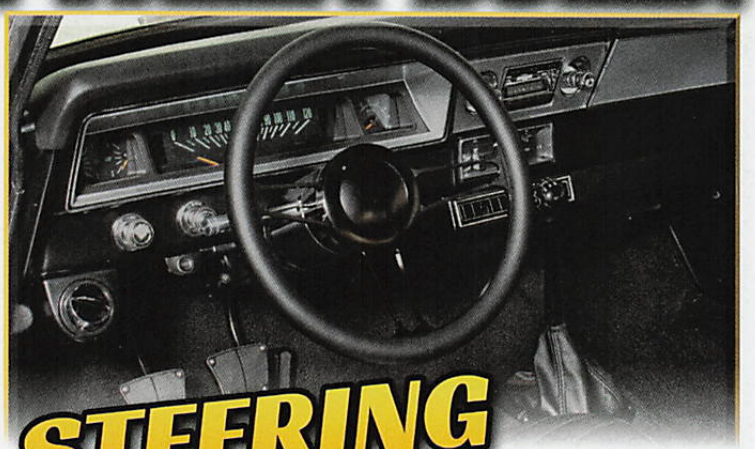
WEEK TO WICKED

CHECK IT OUT.
ANOTHER ONE-WEEK BUILD!



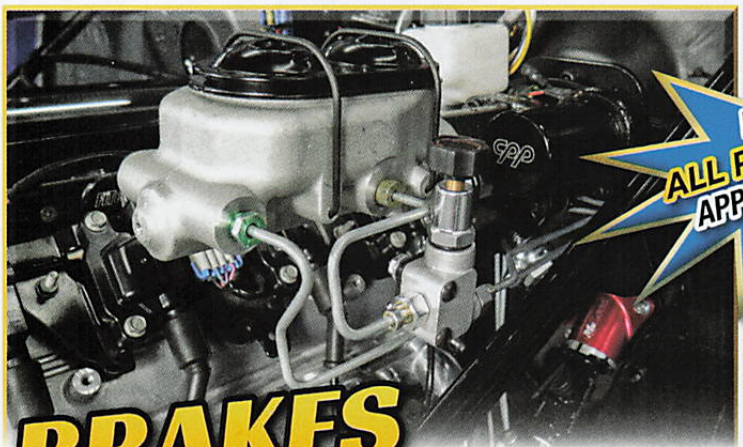
LS ENGINES

Make CPP your LS headquarters when converting your ride! We carry all the components to help finish installing an engine that requires no maintenance, is super lightweight, puts out unbelievable horsepower and torque, giving you all you need to get it on the road. We've configured kits for every LS conversion!



STEERING

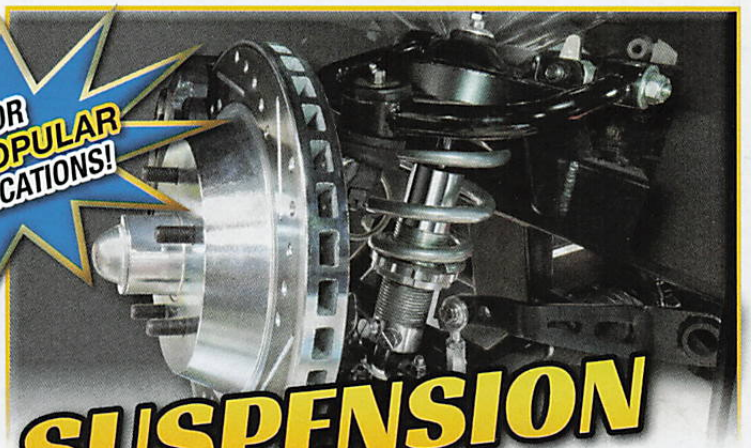
We provide everything from alternator brackets to steering column wiring harnesses and everything in between! 400 & 500Series™ power steering boxes, conversion kits, pumps, steering columns, steering wheels, and rack & pinons. Made with modern technology and ready to upgrade your classic ride.



FOR ALL POPULAR APPLICATIONS!

BRAKES

If you're looking for Brake Kits, we carry a whole host of options! OE style to 14" rotors, 6-piston calipers and HydraStop™ systems. Spindle upgrades! Baer, Wilwood upgrades. Master Cylinder/ Boosters kits and even more components for Chevy, Ford, Mopar, Lincoln, G-Body applications, as well as other customs.



SUSPENSION

Enjoy the comfort and benefits of a suspension system that makes your afternoon ride a pure delight with true performance IFS Mustang II systems, Pro-Touring packages, coil-over conversion kits, Totally Tubular™ control arms, stock control arms, performance, and high clearance sway bars! Currie rear ends and more!

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CPP PRODUCT CATALOG!